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zoosystema

Publications Scientifiques du Muséum, Paris

Éditorial / *Editorial*

Zoosystema entre dans sa troisième année et fait suite à un siècle de *Bulletin du Muséum national d'Histoire naturelle.* Notre revue a probablement plus évolué au cours des dernières années, avec une nouvelle couverture et une nouvelle maquette, qu'au cours de plusieurs décennies. La qualité éditoriale a aussi été profondément améliorée, grâce en particulier à l'aide d'un Comité Scientifique national et international. C'est à Christian Érard, puis Danielle Defaye que nous devons ce remaniement et l'important travail éditorial des deux dernières années. Danielle Defaye souhaitant consacrer plus de temps à d'autres activités, Philippe Bouchet, Directeur des Publications Scientifiques du Muséum, m'a demandé de prendre la responsabilité de *Zoosystema.* Cela impliquait, bien sûr, d'abandonner la direction des *Mémoires du Muséum national d'Histoire naturelle,* que j'assurais depuis six ans, ce que je fais avec nostalgie, mais heureux que cela donne à une nouvelle équipe l'opportunité de prendre la relève.

L'équipe de rédaction de *Zoosystema* est maintenant élargie et comprendra, en plus de Danielle Defaye et de moi-même, Annemarie Ohler, qui se chargera des aspects nomenclaturaux, comme elle le faisait déjà avec efficacité, et Barrie G. M. Jamieson, Correspondant du Muséum à Brisbane (Australie) qui assurera la qualité de la langue anglaise et nous fera bénéficier de sa grande culture zoologique.

Zoosystema restera consacrée à l'inventaire, l'analyse et l'interprétation de la biodiversité animale. Les articles de systématique continueront à constituer l'essentiel de notre revue, suivant la ligne éditoriale précédemment définie (Érard & Defaye 1997). Comme chacun le sait, ces articles, généralement peu cités à brève échéance, le sont, par contre, sur une très longue période, qui se mesure en décennies.

Je remercie les auteurs qui ont fait confiance à notre revue et les rapporteurs dont la compétence a contribué à sa qualité actuelle. J'espère que nombreux sont ceux qui continueront à désirer publier dans *Zoosystema.*

Zoosystema *is now entering its third year, following one century as the* Bulletin du Muséum national d'Histoire naturelle. *Our journal has probably evolved more in these three years, with a new cover and a new lay-out, than during several former decades. The editorial quality has been profoundly improved, particularly thanks to a national and international Scientific Committee. Christian Érard and Danielle Defaye must be thanked for this reshaping and for carrying the major editorial burden for the last two years. Danielle wished to dedicate more time to other activities, and therefore Philippe Bouchet, Director of the Scientific Publications of the Muséum, asked me to take responsibility for* Zoosystema. *This necessitated my relinquishing the position of Editor-in-Chief of the* Mémoires du Muséum national d'Histoire naturelle, *which I had occupied for six years; I accepted, albeit with some nostalgia for the Memoires, but I was happy to give a new team this opportunity to take up my former duties.*

The editorial team of Zoosystema *is now enlarged and will include, in addition to myself and Danielle Defaye, Annemarie Ohler, who will take care of nomenclatural matters, and Barrie G. M. Jamieson, Correspondant of the Muséum in Brisbane (Australia), who will take care of the quality of the English and will provide zoological background.*

Zoosystema *will continue to be devoted to the inventory, analysis and interpretation of animal biodiversity. Papers on systematics will continue to constitute the greater part of our journal, following the editorial scope defined previously (Érard & Defaye 1997). As everybody knows, these articles may be poorly cited in the short term, but subsequently often have a currency, in terms of citation, of decades.*

I thank the authors who entrusted their work to our journal and the referees for giving their services. The competence of all of these contributed to its present quality. I expect that an ever-increasing circle of authors will publish in Zoosystema.

Jean-Lou JUSTINE
Rédacteur en chef/*Editor-in-chief*

Érard C. & Defaye D. 1997. — Avant propos. Zoosystema, un renouveau des publications en Zoologie du Muséum national d'Histoire naturelle. *Zoosystema* 19 (1) : 5.

Un nouveau *Macrogyrodactylus* (Monogenea, Gyrodactylidae) parasite de *Heterobranchus longifilis* Valenciennes, 1840 (Téléostéen, Siluriforme) en Côte d'Ivoire

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N'Douba V. & Lambert A. 1999. — Un nouveau *Macrogyrodactylus* (Monogenea, Gyrodactylidae) parasite de *Heterobranchus longifilis* Valenciennes, 1840 (Téléostéen, Siluriforme) en Côte d'Ivoire. *Zoosystema* 21 (1) : 7-11.

MOTS CLÉS
Macrogyrodactylus heterobranchii n.sp., Monogenea, *Heterobranchus longifilis*, Siluriformes, Afrique de l'Ouest.

RÉSUMÉ

Une nouvelle espèce de monogène Gyrodactylidae, *Macrogyrodactylus heterobranchii* n.sp. est décrite pour la première fois chez un Siluriforme du genre *Heterobranchus*, *H. longifilis* Valenciennes, 1840 (Téléostéen), en Côte d'Ivoire (Afrique de l'Ouest). Elle se différencie des autres espèces du genre (*M. clarii* et *M. congolensis*) par la taille des pièces haptoriales et par le nombre d'épines du bulbe génital (8-10).

KEY WORDS
Macrogyrodactylus heterobranchii n.sp., Monogenea, *Heterobranchus longifilis*, Siluriformes, West Africa.

ABSTRACT

A new Macrogyrodactylus *(Monogenea, Gyrodactylidae) parasite of* Heterobranchus longifilis *Valenciennes, 1840 (Teleostei, Siluriformes) from Ivory Coast.*

A new species of Gyrodactylidae (Monogenea), *Macrogyrodactylus heterobranchii* n.sp. is described for the first time on a siluriform catfish of the genus *Heterobranchus*: *H. longifilis* Valenciennes, 1840 (Teleostei) in Ivory Coast (West Africa). This species can be distinguished from the other species of the genus (*M. clarii* and *M. congolensis*) by the size of sclerotized parts of the haptor and the number of spines of the genital bulb (8-10).

INTRODUCTION

Actuellement, le genre *Macrogyrodactylus* Malmberg, 1956 comporte six espèces : *M. polypteri* Malmberg, 1956 chez *Polypterus senegalus* Cuvier, 1829 en Gambie, au Soudan (Khalil 1964) et chez *P. bichir* Geoffroy, 1802 au Soudan (Saoud & Mageed 1969) ; *M. congolensis* (Prudhoe, 1957) chez *Clarias lazera* Cuvier *et* Valenciennes, 1840 [syn : *C. gariepinus* (Burchell, 1822)] au Zaïre et au Congo et chez *Clarias mossambicus* Peters, 1852 en Ouganda (Paperna 1979) ; *M. clarii* Gusev, 1961 chez *Clarias lazera* Cuvier *et* Valenciennes, 1840 en Éthiopie, signalé sur le même hôte au Ghana, en Ouganda (Paperna 1979), en Égypte (El-Naggar & Serag 1987) et chez *Clarias anguillaris* (Linnaeus, 1762) au Nigeria (Shotter 1980) ; *M. latesi* Paperna, 1969 chez *Lates niloticus* Linnaeus, 1762 (Centropomidae) au Ghana (Paperna 1969) ; *M. anabantii* Paperna, 1973 et *M. ctenopomii* Paperna, 1973 chez *Ctenopoma muriei* (Boulanger, 1904) en Ouganda (Paperna 1973) ; *M. congolensis karibae* Douëllou *et* Chishawa, 1995 chez *Clarias gariepinus* (Burchell, 1822) au Zimbabwe.
Nous décrivons une nouvelle espèce trouvée chez *Heterobranchus longifilis* Valenciennes, 1840 en Côte d'Ivoire.

MATÉRIEL ET MÉTHODES

Les poissons, capturés à l'aide de filets maillants dans la rivière Agnéby en Côte d'Ivoire, sont immédiatement disséqués et les arcs branchiaux gauches, séparés par section ventrale et dorsale, sont conservés dans l'azote liquide. Au laboratoire, après décongélation, les parasites sont détachés de la branchie par rinçage intense. Les monogènes sont alors montés dans une goutte de mélange picrate d'ammonium-glycérine selon Malmberg (1957). Les préparations, recouvertes d'une lamelle, sont lutées au « glyceel ». Les observations au microscope s'accompagnent des dessins des pièces sclérifiées du hapteur et de l'appareil copulateur à l'aide d'une chambre claire. Les mensurations effectuées sont conformes à la Figure 1. Toutes les mesures – moyenne, déviation standard, minimum, maximum – sont exprimées en micromètres.

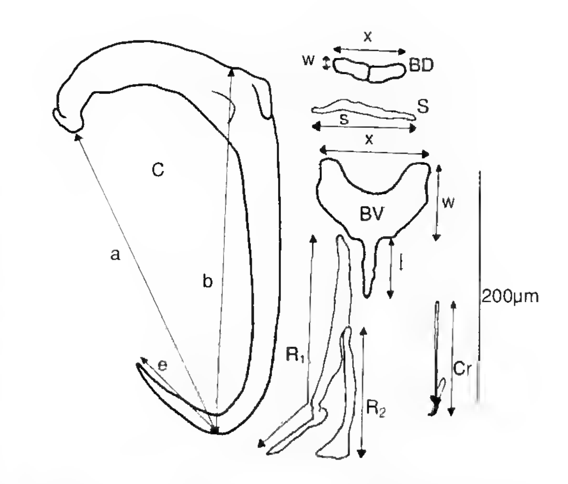


Fig. 1. — Mesures utilisées dans cette étude. **BD**, barre dorsale (w, largeur ; x, longueur) ; **BV**, barre ventrale (l, longueur de la pointe ; w, largeur ; x, longueur) ; **C**, crochet (a, longueur totale ; b, longueur de la lame e, longueur de la pointe) ; **S**, sclérite (s, longueur du sclérite) ; **Cr**, crocheton ; R_1, R_2, sclérites ventraux.

SYSTÉMATIQUE

Macrogyrodactylus heterobranchii n.sp.

Matériel-type. — Holotype déposé au Muséum national d'Histoire naturelle, Paris (MNHN), n° 575 HF, lame Tk92; paratypes déposés au MNHN, n° 574 HF, lame Tk91 et au Musée Royal de l'Afrique Centrale (MRAC), n° 37414.

Matériel étudié. — Douze individus adultes.

Hôte. — *Heterobranchus longifilis* Valenciennes, 1840.

Localisation. — Branchies.

Origine géographique. — Agnéby (Côte d'Ivoire).

Description (Fig. 2)
Morphologie et anatomie générale conforme à la description du genre (Malmberg 1956 ; El-Naggar & Serag 1987).
Adultes de grande taille : longueur 3130 ± 345 (2550-3600) ; largeur 420 ± 62 (350-550). Pharynx : 195 ± 14 (150-200) de diamètre.

Hapteur bien individualisé, bordé latéralement de filaments cuticulaires d'un nombre variant entre 22 et 29 ; une paire de crochets très développés ; barre ventrale en « Y » ; barre dorsale double ; une paire de sclérites en position antéro-latérale, près des crochetons antérieurs ; deux paires de sclérites ventraux : R_1 articulé à la barre ventrale et dont la partie postérieure est coudée de façon caractéristique et R_2 articulé sur le tiers antérieur de R_1 élargi dans sa partie postérieure ; huit paires de crochetons, avec sept paires alignées sur la frange postérieure du hapteur et une

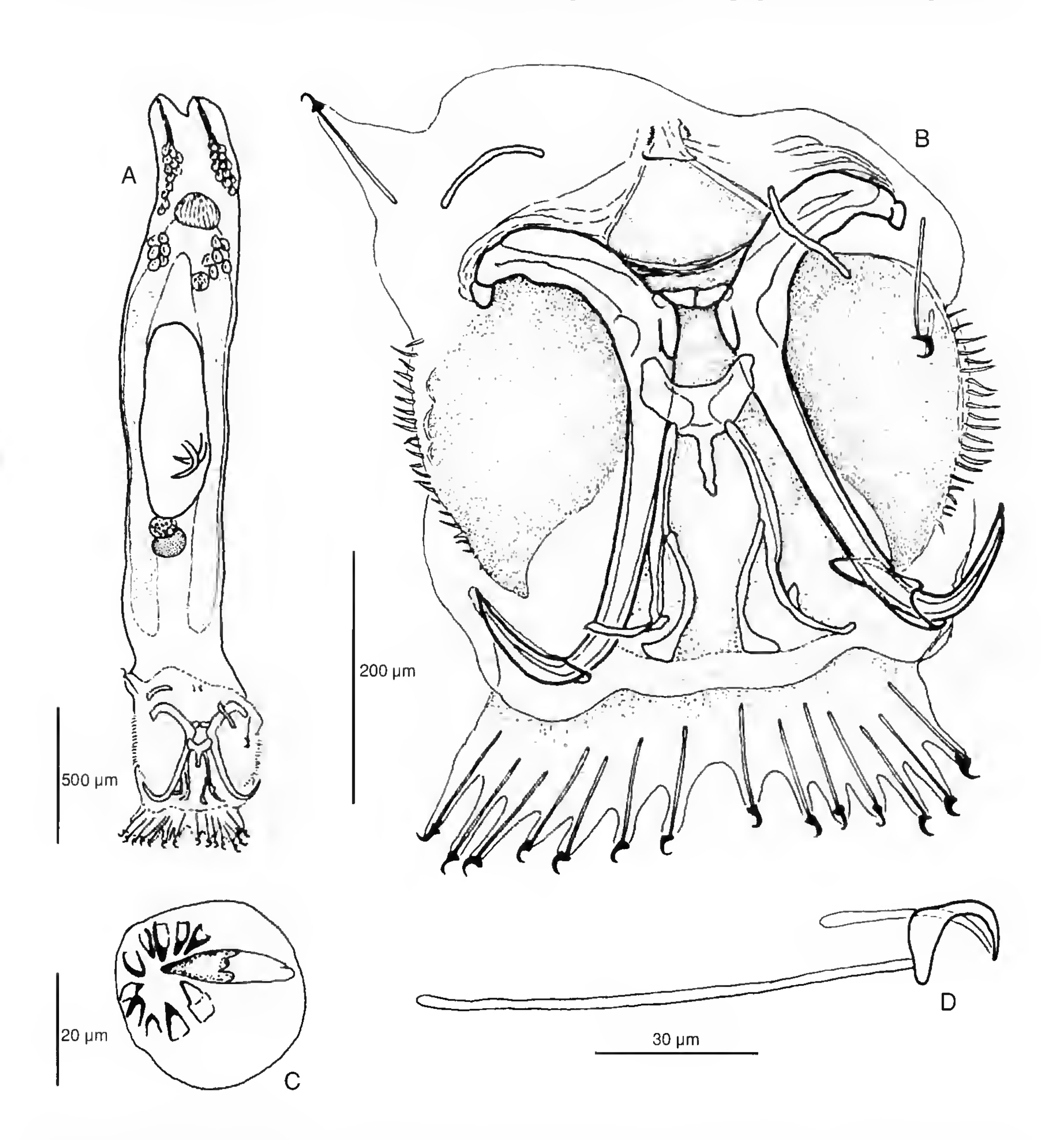


FIG. 2. — *Macrogyrodactylus heterobranchii* n.sp. ; **A**, specimen *in toto*, habitus ; **B**, détail du hapteur ; **C**, bulbe génital ; **D**, détail d'un crocheton.

paire dans la partie antéro-latérale. Bulbe génital : 38 ± 1,8 (35-40) de diamètre avec huit à dix petites épines sclérifiées et une grande de 26 ± 2,0 (22-28).

Mensurations des pièces haptoriales
Crochets : a = 300 ± 9,2 (290-325) ; b = 315 ± 7,8 (305-330) ; c = 98 ± 4,4 (90-110). Barre dorsale : x = 65 ± 4,3 (60-75) ; w = 15 ± 0. Barre ventrale : x = 100 ± 9,0 (90-110) ; w = 69 ± 3,6 (65-75). l = 51 ± 4,1 (45-60). R_1 = 213 ± 6,1 (200-225) ; R_2 = 115 ± 5,8 (105-125). Sclérites antéro-latéraux : S = 92 ± 4,6 (85-100). Crochetons : I à VIII = 100 ± 5,5 (90-110).

DISCUSSION

Les espèces du genre *Macrogyrodactylus* récoltées chez des Centropomidae (*M. latesi*), des Anabantidae (*M. anabantii* et *M. ctenopomii*) et des Polypteridae (*M. polypteri*) sont, par toutes les données métriques, très différentes de celles décrites chez les siluriformes du genre *Clarias*, *M. clarii* et *M. congolensis*. Nos spécimens récoltés sur un *Heterobranchus* se rapprochent de ces deux espèces, mais présentent suffisamment de différences pour justifier d'un nouveau statut spécifique. Le Tableau 1 en résume l'essentiel.

M. heterobranchii se distingue principalement de *M. congolensis* par la taille des crochetons, de la barre dorsale et du sclérite antéro-latéral ; de *M. clarii* par la taille des crochets, de R_1 et R_2 et de ces deux espèces par le nombre d'épines du bulbe génital qui n'excèdent pas dix. Selon ces critères, *M. congolensis karibae* correspondrait à une entité spécifique. Cependant, pour l'affirmer, il sera nécessaire de reconsidérer les espèces de *Macrogyrodactylus* parasites des Siluriformes du genre *Clarias* pour connaître la variabilité morphologique intraspécifique en fonction des espèces-hôtes, de leur origine géographique et de leur environnement ichtyologique.

Remerciements
Ce travail a été réalisé dans le cadre du projet VLIR/KUL : Biodiversité C. I. par l'unité de recherche parasitologie. Les auteurs remercient les coordonnateurs, le professeur Thys Van der

TABLEAU 1. — Caractéristiques morphologiques de *Macrogyrodactylus heterobranchii*, *M. clarii* et *M. congolensis*. (1) d'après Gusev (1961) ; (2) d'après El-Naggar & Serag (1987) ; (3) d'après Prudhoe (1957) ; (4) d'après Douëllou & Chishawa (1995) (*M. congolensis karibae*). B.g. : bulbe génital.

	M. heterobranchii n.sp.	**M. clarii**	**M. congolensis**
Crochetons	(90-110)	110[(1)] (91-101)[(2)]	(71,1-88)[(4)]
Crochets a	(290-325)	430[(1)] (376-392)[(2)]	470[(3)] (252,3-314,2)[(4)]
Barre dorsale	(60-75)	40[(1)] (64-72)[(2)]	120[(3)] (78-93,2)[(4)]
Sclérite antéro-latéral	(85-100)	110[(1)] (76-82)[(2)]	50[(4)]
B.g. : nombre d'épines	(8-10)	16[(1)] 12[(2)]	15[(3)] 14[(4)]
R_1	(200-225)	250[(1)] 235[(2)]	240[(3)] 175[(4)]
R_2	(105-125)	150[(1)] 135[(2)]	120[(3)] 125[(4)]

Audenaerde et le Dr Guy Teugels du Musée Royal de l'Afrique Centrale (Tervuren), et le Dr Germain Gourène responsable local de ce projet ; ainsi que Nathalie Le Brun, Sylvie Euzet et Nadine Maury du Laboratoire de Parasitologie comparée de l'université Montpellier II. Nous remercions Monsieur le professeur Louis Euzet pour sa lecture du manuscrit.

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Some remarks on the subgenus *Oligotrochus* M. Sars, 1866 *sensu* Heding, 1935 (genus *Myriotrochus*, Myriotrochidae, Holothurioidea) with description of two new species

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Smirnov A. 1999. — Some remarks on the subgenus *Oligotrochus* M. Sars, 1866 *sensu* Heding, 1935 (genus *Myriotrochus*, Myriotrochidae, Holothurioidea) with description of two new species. *Zoosystema* 21 (1) : 13-27.

ABSTRACT
The composition and evolution of the subgenus *Oligotrochus* [genus *Myriotrochus* (Myriotrochidae, Apodida, Holothurioidea)] are discussed. In addition to the type species of the subgenus, *M.* (*O.*) *vitreus* (M. Sars, 1866), two other species are transferred to this subgenus: *M.* (*O.*) *clarki* Gage *et* Billett, 1986 and *M.* (*O.*) *bathybius* H. L. Clark, 1920. Moreover, two new species are described: *M.* (*O.*) *rotulus* n.sp. from the West Galicia coast, Spain, Northeast Atlantic and *M.* (*O.*) *neocaledonicus* n.sp. from the Loyalty Islands Basin, New Caledonia, Pacific. *M.* (*O.*) *rotulus* n.sp. is characterized by wheels with "fused spokes". The spokes in these wheels are swollen and sometimes are fused, leaving small oval holes near the hub. The number of these holes corresponds to the number of fused pairs of spokes and ranges from two up to the total number of spokes. These wheels usually have less hub perforations than spokes, because not all of the spokes are fused. The latter character and a smaller size of the wheels clearly differ *M. rotulus* from *M. bathybius* and *M. neocaledonicus*, which have wheels with hub penetrated by a complete circle of perforations. *M.* (*O.*) *neocaledonicus* n.sp. is characterized by wheels with perforated hub which closely resemble wheels of *M.* (*O.*) *bathybius*. The new species differs from *M.* (*O.*) *bathybius* in having a smaller length of hub perforations and by the shape of these perforations (triangular or ovoid-triangular in *M.* (*O.*) *neocaledonicus*, and ovoid in *M.* (*O.*) *bathybius*). An identification key for the species belonging to the subgenus *Oligotrochus* is given.

KEY WORDS
Holothurians,
Myriotrochidae,
new species,
Northeast Atlantic,
New Caledonia.

RÉSUMÉ

Remarques sur le sous-genre Oligotrochus *M. Sars, 1866* sensu *Heding, 1935 (genre* Myriotrochus, *Holothurioidea, Myriotrochidae) et description de deux nouvelles espèces.*

La composition et l'évolution du sous-genre *Myriotrochus* du genre *Oligotrochus* (Myriotrochidae, Apodida, Holothurioidea) sont discutées. En plus de *M.* (*O*). *vitreus* (M. Sars, 1866), l'espèce-type du sous-genre, deux autres espèces sont transférées dans ce sous-genre : *M.* (*O.*) *clarki* Gage *et* Billett, 1986 et *M.* (*O.*) *bathybius* H. L. Clark, 1920. De plus, deux espèces nouvelles sont décrites : *M.* (*O.*) *rotulus* n.sp. de la côte ouest de la Galice (Espagne, Atlantique Nord-Est) et *M.* (*O.*) *neocaledonicus* n.sp. du bassin des îles Loyauté (Nouvelle-Calédonie, Pacifique). *M.* (*O.*) *rotulus* n.sp. est caractérisée par des roues avec des "rayons fusionnés". Les rayons dans ces roues sont élargis dans la partie médiane, et fusionnent parfois, laissant de petits trous ovoïdes près du moyeu. Le nombre de ces trous correspond au nombre de couples de rayons fusionnés et varie de deux jusqu'au nombre complet des rayons. Ces roues possèdent habituellement moins de trous que de rayons, les rayons n'étant pas tous fusionnés. Par ce dernier caractère et par la plus petite dimension des roues, *M.* (*O.*) *rotulus* diffère donc de *M.* (*O.*) *bathybius* et de *M.* (*O.*) *neocaledonicus* qui se caractérisent par des roues avec un cercle complet de trous dans le moyeu. *M.* (*O.*) *neocaledonicus* n.sp. est très proche de *M.* (*O.*) *bathybius*, seules la dimension et la configuration de leurs trous restent différentes : chez *M.* (*O.*) *neocalidonicus*, ils sont plus petits et triangulaires, chez *M.* (*O.*) *bathybius*, ils sont ovoïdes ou ovoïdes-triangulaires. Une clé des espèces du sous-genre *Oligotrochus* est proposée.

MOTS CLÉS
Holothuries,
Myriotrochidae,
espèces nouvelles,
Atlantique Nord-Est,
Nouvelle-Calédonie.

INTRODUCTION

The genus *Oligotrochus* was established by M. Sars (1866) for his new species *Oligotrochus vitreus* M. Sars, 1866. A detailed description of the new genus and species were published some years later (M. Sars 1877). In the latter paper M. Sars indicated the following characters to distinguish his new genus from the genus *Myriotrochus* Steenstrup, 1851: (1) "only a very small number of microscopic calcareous wheels being found in the anterior and posterior part of the skin of the body and none elsewhere"; (2) "calcareous wheels lie sunk in the skin of the body, while in the *Myriotrochus* they project above its surface supported on skin-stalks"; (3) "the wheels have usually a smaller number of rays [*i.e.* spokes]"; (4) "the tentacle [in *Oligotrochus*] [...] being more like those of the *Synapta*, round, conically pointed and in their outer part furnished with finger-like branches on both sides of the stem [...] while in the *Myriotrochus* they seem as in the *Chirodota* to be disk-like or hand-shaped at the extremity (tentacula peltato-digitata) their outer half being broader and flattened on the outside, and having finger-like branches on the margin" (M. Sars 1877: 56-57).

Later *Oligotrochus vitreus* was synonymized with *Myriotrochus brevis* (Huxley, 1852) by Danielssen & Koren (1879). The latter name also was synonymized with *Myriotrochus rinkii* Steenstrup, 1851 by Lütken (1857). Correspondingly the genus *Oligotrochus* was regarded as a synonym of the genus *Myriotrochus*.

Östergren (1898) in his famous paper dealing with the system of the apodid holothurians placed two species, *M. rinkii* and *M. vitreus*, in the genus *Myriotrochus*. Later, Östergren (1903) gave a detailed description of *Myriotrochus vitreus* which era-

sed all doubts on the validity of this species. At the same time, he believed that the differences between *M. rinkii* and *M. vitreus* are not strong enough to place these species into two different genera and considered *Oligotrochus* a junior synonym of *Myriotrochus*. Östergren's opinion was accepted by H. L. Clark (1907) in his monograph on apodid holothurians, and by following authors of local faunas (Mortensen 1924; Koehler 1927).

In 1935, Sven Heding studied some new material of *M. vitreus*. Following Östergren (1898, 1903) he believed that differences in wheel characters and in wheels disposition in the body wall are not important enough to place *M. vitreus* and *M. rinkii* into two separate genera. However, he stressed the peculiarity of the tentacle structure of *M. vitreus* (Heding 1935: 23): "The tentacles are very conspicuous, being rather stiff, and 'pinnate' having the digits placed on the sides. The shape of the tentacles is thus very different from that of the tentacles of *M. rinkii*." He proposed to keep *M. vitreus* in the genus *Myriotrochus*, but to place this species in a separate subgenus *Oligotrochus*. In the most recent papers dealing with the family Myriotrochidae (Belyaev & Mironov 1982; Gage & Billett 1986) Heding's suggestion was not cited or commented on, although Belyaev & Mironov (1982) presented new data on the morphology of the calcareous ring of *M. vitreus*, and Gage & Billett (1986) described a new species *M. clarki* which is very close to *M. vitreus*.

Diagnoses of the genus *Myriotrochus* and subgenus *Oligotrochus*, description of two new species, *Myriotrochus* (*Oligotrochus*) *rotulus* and *M.* (*O.*) *neocaledonicus*, and some notes on other species placed in *Oligotrochus* are given below.

METHODS

Following Belyaev (1970), Belyaev & Mironov (1982) and Gage & Billett (1986) for description of the wheel ossicles from the body wall I use the following parameters: D, wheel diameter (µm); S, number of spokes; T, number of teeth; S/T, proportion of spokes to teeth (%); Lt, tooth length (µm); and the ratio Lt/D (%).

The hub centre is sometimes surrounded by a circle of small oval or triangular perforations which correspond in number to that of the spokes (Figs 3, 4). This feature makes it possible to use some additional characters for wheels description: Dhp, the diameter of the primary hub or internal hub diameter, *i.e.* diameter of the circle inside the circle of the hub perforations (µm); the ratio Dhp/D (%); Dhs, the secondary hub diameter, *i.e.* the diameter of the large hub itself; the ratio Dhs/D; Lo, the length of the hub perforations (µm); and the ratio Lo/D (%).

SYSTEMATICS

Genus *Myriotrochus* Steenstrup, 1851

Myriotrochus Steenstrup, 1851: 60. – Lütken 1857: 21. – Semper 1868: 8. – Théel 1877: 2; 1886: 37. – Lampert 1885: 23. – Ludwig 1889-1892: 360. – H. L. Clark 1907: 127. – Heding 1935: 19. – Tortonese 1938: 205. – Belyaev & Mironov 1982: 94, fig. 15.

Diagnosis

Myriotrochidae with twelve tentacles. Calcareous ring consists of ten pieces. Two dorsolateral pieces are double, i.e. possess two anterior processes and additional frontal excavations for tentacular ampullae of two extra tentacles. Other pieces have one anterior process each. Radials are perforated for the passage of the radial nerves. Intestine has a loop. Gonads are paired. Body wall ossicles wheels with a flat hub, nine to twenty-five spokes and large teeth on the inner part of the rim; the teeth are directed towards the centre of the wheel (myriotrochid type).

Subgenus *Oligotrochus* M. Sars, 1866

Oligotrochus M. Sars, 1866: 200 (*pro genus*); 1877: 57 (*pro genus*). – G. Sars 1872: 29 (*pro genus*). – Heding 1935: 21.

Type species. — *Oligotrochus vitreus* M. Sars, 1866, by original designation.

Species included. — Subgenus includes five species: *Oligotrochus vitreus* M. Sars, 1866; *Myriotrochus bathybius* H. L. Clark, 1920; *M. clarki* Gage *et* Billett, 1986; *M. neocaledonicus* n.sp., and *M. rotulus* n.sp.

Diagnosis

Myriotrochus with large conical tentacles with two to five pairs of small lateral digits or (?) without digits. There are no ossicles in the tentacles. Calcareous ring massive, stout, with undulating posterior edge. Body wall ossicles wheels of myriotrochid type with whole hub and/or with hub perforated by a circle of holes.

Discussion

The subgenus *Oligotrochus* is characterized by having conical tentacles which have small finger-like lateral digits whereas the subgenus *Myriotrochus* is characterized by palm-like "peltato-digitate" tentacles. This difference is clearly seen in Figure 1, comparing Heding's figures of the tentacles of *M.* (*Myriotrochus*) *rinkii* (type species of the nominotypical subgenus *Myriotrochus*) and *M.* (*Oligotrochus*) *vitreus* (type species of the subgenus *Oligotrochus*). The drawings and description of the tentacles of other species of the subgenus *Oligotrochus* can be easily found elsewhere: *M.* (*O.*) *vitreus* in M. Sars (1877: 51, table 7, figs 4, 5) and Östergren (1938, tafl. 1, fig. 8); *M.* (*O.*) *clarki* in Gage & Billett (1986: 250, figs 17A, B); *M.* (*O.*) *bathybius* in H. L. Clark (1920: 126); *M.* (*O.*) *bathybius* from Northeast Atlantic in Gage & Billett (1986: 234-235, figs 3E, F); *M.* (*O.*) *neocaledonicus* (Fig. 2).

Myriotrochus (*Oligotrochus*) *vitreus* (M. Sars, 1866)

Oligotrochus vitreus M. Sars, 1866: 200; 1877: 49, table 7, figs 1-17. – G. Sars 1872: 30. – Danielssen & Koren 1879: 111. – Storm 1879: 22.

Myriotrochus vitreus – Östergren 1898: 119; 1903: 18; 1938: tafl. 1, fig. 8, tafl. 2, fig. 12. – Clark 1907: 128, pl. 8, figs 15-20. – Grieg 1912: 12; 1914: 140; 1928: 11. – Mortensen 1924: 256, fig. 128; 1927: 438, fig. 269. – Koehler 1927: 285. – Mortensen & Lieberkind 1928: 32, fig. 64. – Heding 1931: 695. – Djakonov 1933: 159. – Belyaev & Mironov 1982: 97, figs 9, 17. – Hoisæter 1990: 100. – Madsen & Hansen 1994: 122, figs 64G, 82-3, 84, 85, map 34.

Myriotrochus (*Oligotrochus*) *vitreus* – Heding 1935: 23, figs 3-7, pl. 1, figs 1-3, pl. 2, figs 5-8, 13-22, 26-28, pl. 3, figs 1, 2.

Myriotrochus brevis – Danielssen & Koren 1882: 31, table 5, figs 5-7.

Non *Myriotrochus vitreus* – Verrill 1874: 413 = *Myriotrochus rinkii* Steenstrup, 1851.

Non *Myriotrochus vitreus* – Cherbonnier 1970: 1269 = *Myriotrochus clarki* Gage et Billett, 1986.

Non *Myriotrochus vitreus meridionalis* – Salvini-Plawen 1977: 76 = *Prototrochus meridionalis* (Salvini-Plawen, 1977).





Fig. 1 — Tentacle; **A**, *Myriotrochus* (*Myriotrochus*) *rinkii* Steenstrup, 1851; **B**, *Myriotrochus* (*Oligotrochus*) *vitreus* (M. Sars, 1866). Redrawn from Heding (1935).

Remarks

The anatomy and morphology of this species are well described in several papers (M. Sars 1877; Östergren 1903; Heding 1935; Belyaev & Mironov 1982). The species is distributed near Scandinavia from Skagerak to Lofoten and has also been mentioned near the Faroe Islands. It lives at the depth of 90-700 m on muddy bottom (Madsen & Hansen 1994). The record near the Faroe Islands (Madsen & Hansen 1994: map 34) requires confirmation as this location is much further from the well-known distribution area of this species than from where the closely related species *M. clarki* has been found.

Myriotrochus (*Oligotrochus*) *clarki* Gage *et* Billett, 1986

Myriotrochus clarki Gage *et* Billett, 1986: 247, figs 1, 7D, 9D, 13-17, 18A.
Myriotrochus vitreus – Cherbonnier 1970: 1269.

Material examined. — **Northeast Atlantic.** RV *Thalassa*, stn 825, 42°22'4N, 9°28'2W, depth 480-520 m, muddy sand with clay and pebbles, 21.X.1968, 1 specimen deposited in the Muséum national d'Histoire naturelle (MNHN), Paris, No. EcHh 2511.

Remarks

This species is very similar to *M. vitreus* and it was described from the Rockall Trough at depths between 1605 and 2515 m only recently. The specimen described by Cherbonnier as *Myriotrochus vitreus* is 15 mm long and 3.5 mm in diameter without ossicles in the body wall. The stout calcareous ring, which has high ventral and lateral pieces (the ventral pieces are twice as long as the dorsal ones), is very similar to the calcareous ring of *M. vitreus* and *M. clarki*. Twelve conical tentacles have one or two pairs of small lateral digits. These characters enable this specimen to be identified as *M. clarki*, which also has two pairs of small lateral digits on each tentacle, contrary to *M. vitreus* which has four to five pairs.

Myriotrochus (*Oligotrochus*) *bathybius* H. L. Clark, 1920

Myriotrochus bathybius H. L. Clark, 1920: 126, pl. 4, fig. 3. – Carney & Carey 1976: 69. – Gage & Billett 1986: 234, figs 1, 3-6, 7A, B, 9A, B, 18B.

Remarks

This species was described from the eastern tropical Pacific, 4°33'S, 87°42'30"W, from the depth of 3665 m (H. L. Clark 1920), and later was mentioned without description by Carney & Carey (1976) from the Oregon coast at a depth of 4000 m. Gage & Billett (1986) described specimens from the Rockall Trough, and Porcupine Seabight, in the Northeast Atlantic (1800-4310 m) with wheels that have the hub perforated by a circle of holes, as *M. bathybius*. They also cited the unpublished data of the late Dr Bent Hansen concerning myriotrochid specimens from the South Atlantic and Indian Oceans identified as *M. bathybius*.

The wheels of the Northeast Atlantic specimens described by Gage & Billett (1986) differ somewhat from the wheels of the holotype of *M. bathybius* (Figs 4B, C), and there are therefore some doubts as to the identification of the Northeast Atlantic specimens as *M. bathybius*. Unfortunately, the holotype of *M. bathybius* stored in the Museum of Natural History,

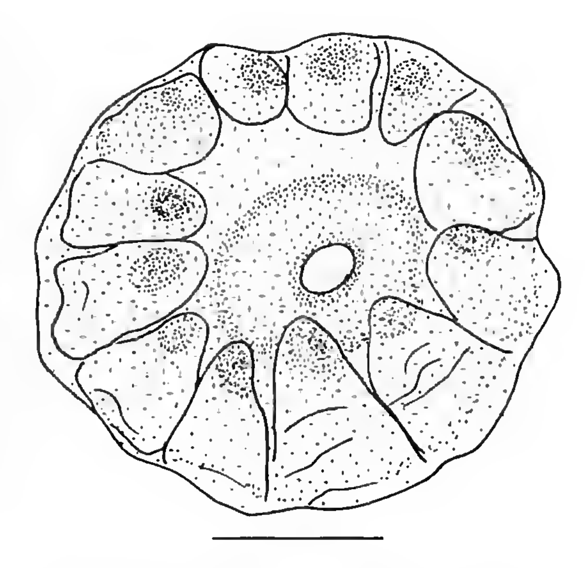


Fig. 2. — *Myriotrochus* (*Oligotrochus*) *neocaledonicus* n.sp.; anterior part, view from above. Scale bar: 1 mm.

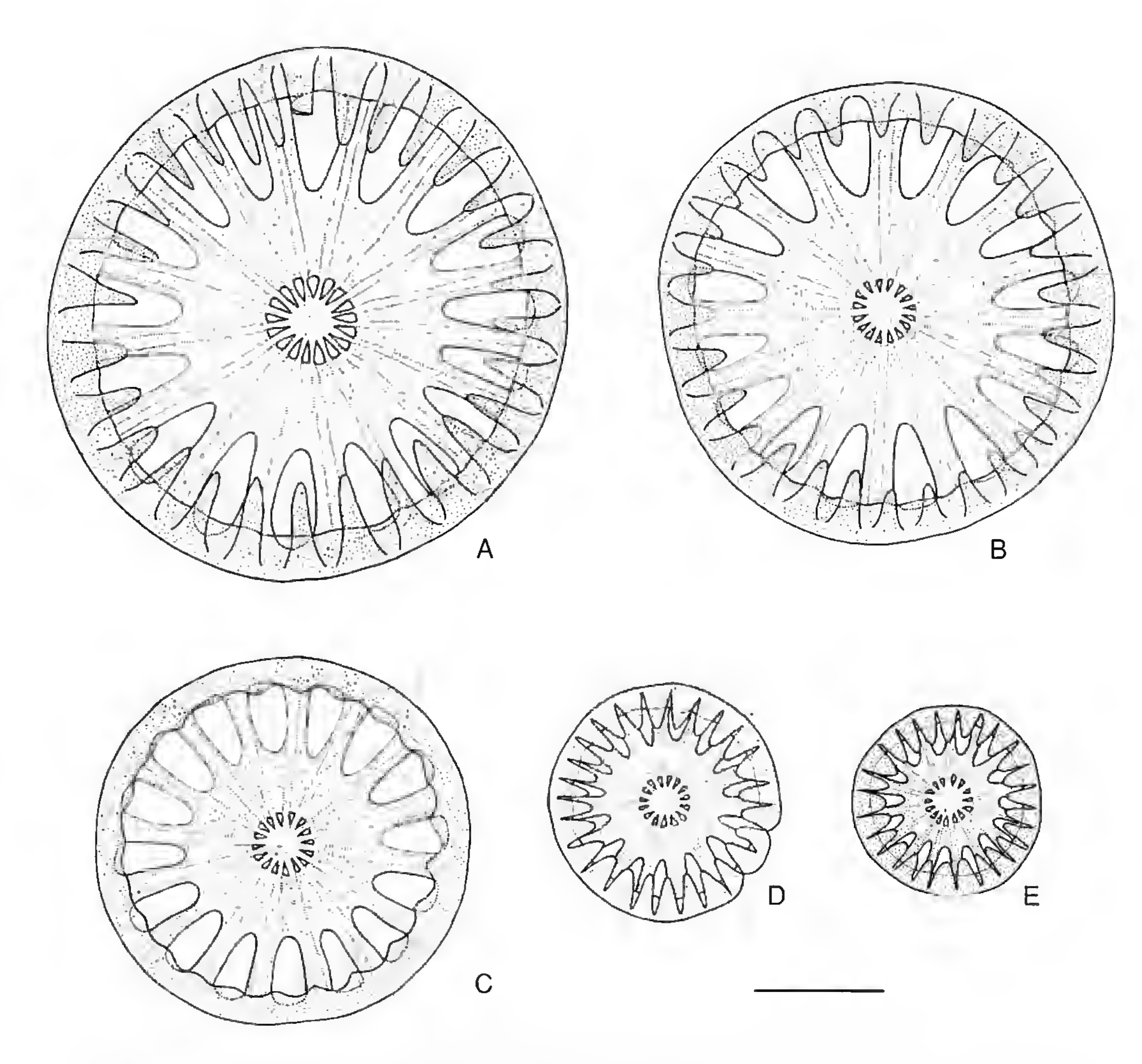


Fig. 3. — *Myriotrochus* (*Oligotrochus*) *neocaledonicus* n.sp.; **A**-**B**, large wheels from the body wall; **C**, wheel with reduced teeth; **D**-**E**, small wheels from the anterior portion of the body. Scale bar: 100 µm.

Smithsonian Institution, Washington D.C. is almost lacking wheels and the microscopical slide with wheels described by H. L. Clark (1920) is untraceable. Thus, it is necessary to find new material from the type locality of *M. bathybius* for redescription. Only then will it be possible to justify the determination of the Northeast Atlantic material as *M. bathybius*.

Myriotrochus neocaledonicus n.sp.

Material examined. — **New Caledonia.** Loyalty Islands Basin, expedition Biogeocal, RV *Coriolis*, stn CP232, 21°33'81-21°34'04 S, 166°19'84-166°27'18 E, 760-790 m depth, beam trawl, 12.IV.1987, holotype stored in the MNHN, No. EcHh 8007.

Etymology. — The species is named after the New Caledonian region.

Description

The fragment of the anterior portion of the body with the calcareous ring is 3 mm in diameter and 1.2 mm long; the shapeless body fragment is

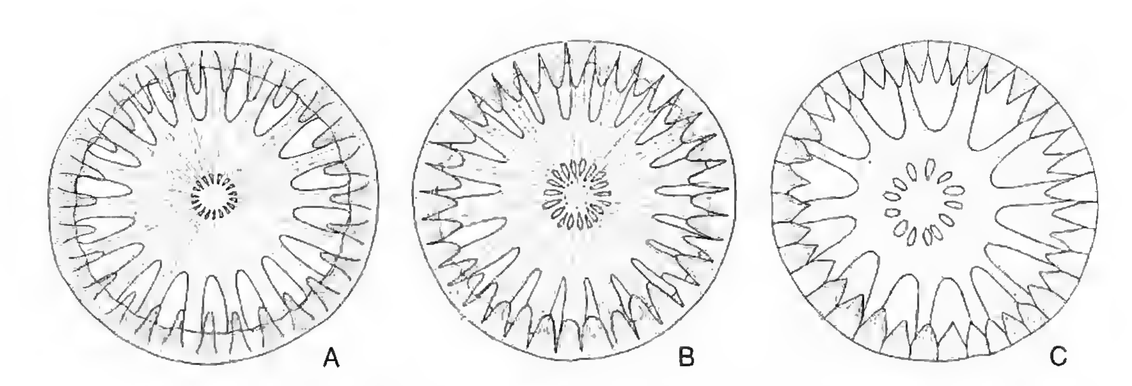


Fig. 4. — Comparison of the wheels of *Myriotrochus* (*Oligotrochus*) *neocaledonicus* n.sp. and *M.* (*O.*) *bathybius* H. L. Clark, 1920; **A**, *M.* (*O.*) *neocaledonicus* n.sp. (holotype); **B**, *M.* (*O.*) *bathybius* from Northeast Atlantic (SMBA, stn ES27); **C**, *M.* (*O.*) *bathybius* from Pacific, holotype (redrawn from H. L. Clark 1920, pl. 4, fig. 3). Scaled to the same size.

Table 1. — Parameters of the common wheels of *Myriotrochus* (*Oligotrochus*) *neocaledonicus* n.sp. See "Methods" for abbreviations.

Parameter	D (µm)	S	T	S/T (%)	Dhp (µm)	Dhp/D (%)	Dhs (µm)	Dhs/D (%)	Lo (µm)	Lo/D (%)	Lt (µm)	Lt/D (%)
	300	16			25	8.3	145	48.3	13	4.3		
	330	17	27	63.0	25	7.6	160	48.5	11	3.3	65	19.7
	350	15	26	57.7	20	5.7	170	48.6	11	3.1	70	20.0
	360	16	28	57.1	28	7.8	180	50	12	3.3	63	17.5
	365	16	26	61.5	28	7.7	185	50.7	13	3.6	75	20.5
	395	18	27	66.7	30	7.6	185	46.8	15	3.8	65	16.5
	410	17	28	60.7	35	8.5	205	50	15	3.7	80	19.5
	410	17	29	58.6	30	7.3	205	50	20	4.9	80	19.5
	450	16	29	55.2	33	7.3	235	52.2	20	4.4	90	20.0
n	9	9	8	8	9	9	9	9	9	9	8	8
mean	374.4	16.4	27.5	60.06	28.2	7.54	185.6	49.46	14.4	3.83	73.5	19.2
σ	46.2	0.9	1.2	3.68	4.5	0.80	26.9	1.58	3.5	0.59	9.5	1.4

Table 2. — Parameters of the small wheels of *Myriotrochus* (*Oligotrochus*) *neocaledonicus* n.sp. See "Methods" for abbreviations.

Parameter	D (µm)	S	T	S/T (%)	Dhp (µm)	Dhp/D (%)	Dhs (µm)	Dhs/D (%)	Lo (µm)	Lo/D (%)	Lt (µm)	Lt/D (%)
	120	14	25	56.0								
	155	15	25	60.0	18	11.6	80	51.6	10	6.5		
	160	15	25	60.0	20	12.5	73	45.6	10	6.3	32	20
	185	15	26	57.7	20	10.8	95	51.4	11	6.0	37	20
n	4	4	4	4	3	3	3	3	3	3	2	2
mean	155.0	14.8	25.3	58.42	19.3	11.63	82.7	49.53	10.3	6.22	34.5	20
σ	26.77	0.50	0.50	1.948	1.15	0.850	11.24	3.408	0.58	0.25	3.54	0

5 mm long. The skin is semitransparent; the colour in alcohol is whitish.

There are twelve conical tentacles. I could not find the lateral digits but this may be caused by contraction of the specimen and/or poor conservation. Tentacles are attached to the frontal side

TABLE 3. — Wheels parameters of *Myriotrochus* (*Oligotrochus*) *neocaledonicus* n.sp., *M.* (*O.*) *bathybius* from Central Pacific (after H. L. Clark 1920, pl. 4, fig. 3), *M.* (*O.*) *bathybius* from SMBA, stn ES27, Northeast Atlantic and *M.* (*O.*) *bathybius* from Northeast Atlantic (data on all Northeast Atlantic SMBA specimens which had been investigated by Gage & Billett 1986). See "Methods" for abbreviations.

Character	*M.* (*O.*) *neo-caledonicus*	*M.* (*O.*) *bathybius*, Pacific	*M.* (*O.*) *bathybius*, stn ES27	*M.* (*O.*) *bathybius*, Atlantic	Character	*M.* (*O.*) *neo-caledonicus*	*M.* (*O.*) *bathybius*, Pacific	*M.* (*O.*) *bathybius*, stn ES27	*M.* (*O.*) *bathybius*, Atlantic
D (µm)					Dhs (µm)				
mean	306.9	300	326.7	312.1	mean	159.8	130	157.5	–
n	13	1	6	339	n	12	1	6	
σ	112.8		40.3		σ	52.1		19.0	
min.	120		275	209	min.	73		130	
max.	450		380	398	max.	235		185	
S					Dhs/D (%)				
mean	15.9	13.0	17.0	15.5	mean	49.5	43.34	8.3	–
n	13	1	6	108	n	12	1	6	
σ	1.1		2.6		σ	2.0		2.0	
min.	14		13	10	min.	45.6		45.7	
max.	18		20	23	max.	52.2		51.6	
T					Lo (µm)				
mean	26.8	38.0	35.0	31.5	mean	13.4	17.0	21.3	–
n	12	1	6	106	n	12	1	6	
σ	1.5		2.5		σ	3.5		2.3	
min.	25		32	26	min.	10		18	
max.	29		38	40	max.	20		25	
S/T (%)					Lo/D (%)				
mean	59.5	34.2	48.7	50.3	mean	4.4	6.7	6.5	–
n	12	1	6	106	n	12	1	6	
σ	3.2		8.1		σ	1.2		0.3	
min.	55.2		40.6	34	min.	3.1		6.2	
max.	66.7		62.5	82	max.	6.5		7.0	
Dhp (µm)					Lt (µm)				
mean	26.0	40	28.5	–	mean	65.7	38	48.5	
n	12	1	6		n	10	1	6	
σ	5.6		4.8		σ	18.5		6.5	
min.	18		22		min.	32		38	
max.	35		35		max.	90		55	
Dhp/D (%)					Lt/D (%)				
mean	8.6	13.3	8.7	–	mean	19.1	12.7	14.8	–
n	12	1	6		n	10	1	6	
σ	2.0		0.8		s	1.7		0.8	
min.	5.7		7.6		min.	15.2		13.8	
max.	12.5		9.5		max.	20.5		19.6	

of the calcareous ring and are directed towards the oral orifice (Fig. 2).

Calcareous ring consists of ten pieces. The height of the pieces decreases slightly from ventral to dorsal side. The posterior surface of the pieces is concave, thus the lower contour of the ring is undulating. The anterior processes are relatively short.

TABLE 4. — Parameters of the wheels of myriotrochid type of *Myriotrochus* (*Oligotrochus*) *rotulus* n.sp. See "Methods" for abbreviations.

Parameter	D (µm)	S	T	S/T (%)	Dhp (µm)	Dhp/D (%)	Lt (µm)	Lt/D (%)
	70	11	19	57.9	13	18.6	16	22.8
	70	12	19	63.2	12	17.1	17	24.3
	75	12	20	60.0	14	18.7	17	22.7
	78	13	21	61.9	18	23.1	17	21.8
	80	12	22	54.6	18	22.5	18	22.5
n	5	5	5	5	5	5	5	5
mean	73.3	12.0	19.8	59.5	15.0	19.99	17.0	22.82
σ	4.6	0.7	1.3	3.41	2.8	2.63	0.7	0.91

Unfortunately, owing to the poor condition of the material it is impossible to describe the internal anatomy of the species.

Calcareous ossicles of the body wall are represented only by wheels with perforated hub. The large hub has small perforations of triangular or oval-triangular shape forming a regular circle (Fig. 3). Number of perforations corresponds to the number of spokes. Wheels in the body wall have a large size ranging from 300 to 450 µm. Wheel parameters are given in Table 1.

In the very anterior portion of the body, close to the calcareous ring, there are wheels of the same structure as just described, but of much smaller size 120-185 µm in diameter (Fig. 3D, E). Parameters of these small wheels are given in Table 2.

Comparison between the wheels of *M. neocaledonicus* and *M. bathybius* are given in Table 3. Wheel teeth vary in size and are almost lacking in one wheel (Fig. 3C).

There are no calcareous ossicles in the tentacles.

DISCUSSION

The single myriotrochid species characterized by the wheels with hub perforated by a circle of holes is *M. bathybius* H. L. Clark, 1920.

Because of the lack of information of the calcareous ossicles on the holotype of *M. bathybius* the only way to compare *M. neocaledonicus* with *M. bathybius* is to use Clark's description and drawing (Clark 1920: 126, 127, pl. 4, fig. 3). During my visit to the London Natural History Museum in 1985 I studied the wheels ossicles of Gage & Billett's specimens from the Northeast Atlantic (SMBA, stn ES27, 54°40'N, 12°16'W, 2880 m). This gave me the opportunity to compare the new species with the Northeast Atlantic specimens, not only by means of traditional characters, but also using such parameters as the internal hub diameter and the length of the hub hole.

The wheels of Northeast Atlantic specimens described by Gage & Billett (1986) differ somewhat from the wheels of the holotype of *M. bathybius*. Thus, I compare *M. neocaledonicus* with the holotype of *M. bathybius*, and with the Northeast Atlantic specimens identified by Gage & Billett (1986) as *M. bathybius* separately (Table 3).

The new species clearly differs from the holotype of *M. bathybius* and from the Northeast Atlantic specimens in having a smaller length of hub perforations (Table 3). The average length of perforations in *M. neocaledonicus* is 13.4 ± 1.0 µm, the perforation length of the holotype of *M. bathybius* measured from the drawing of H. L. Clark (1920) is 17 µm and the average perforation length of the Northeast Atlantic specimen is 21.3 ± 1.0 µm. Correspondingly, the average Lo/D ratios are 4.4 ± 0.4%, 6.7% and 6.5 ± 0.1%. The shape of these perforations are triangular or ovoid-triangular in *M. neocaledonicus*, and ovoid in the holotype of *M. bathybius* and the Northeast Atlantic specimens of *M. bathybius* (Fig. 4).

Unfortunately, the small number of wheels in the specimens at hand did not allow to use traditional statistical methods for comparing the wheel's parameters. The new species differs in having a

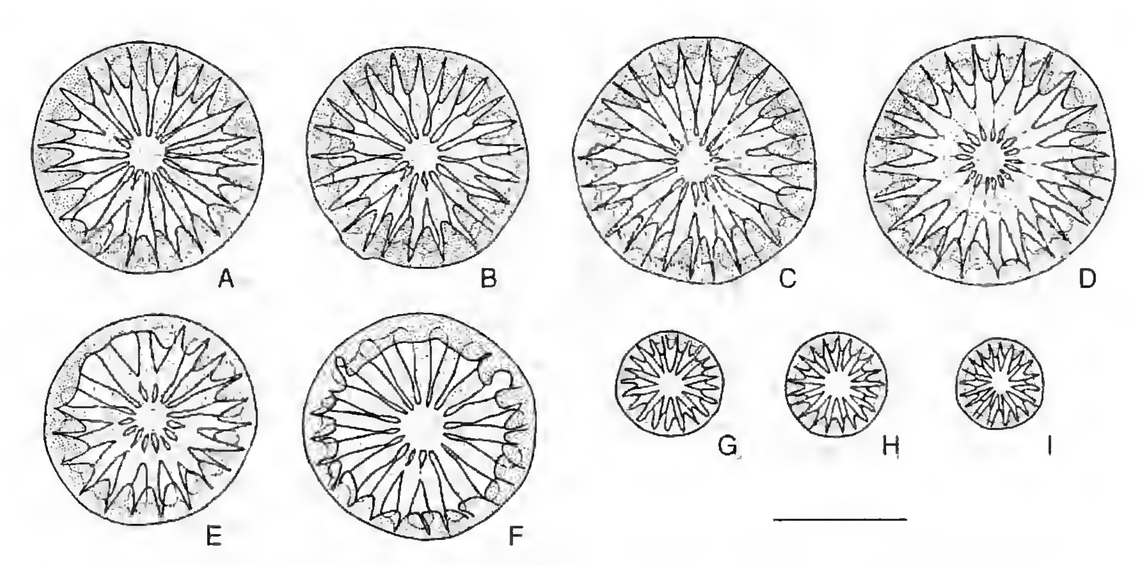


FIG. 5. — *Myriotrochus rotulus* n.sp.; **A-F**, wheels with fused spokes; **E-F**, wheels with some teeth merged with each other; **G-I**, wheels of myriotrochid type. Scale bar: 100 µm.

smaller number of teeth (Table 3) and hence by a larger S/T ratio. Besides, *M. bathybius* seems to live deeper than *M. neocaledonicus*. Up to now, the new species has been collected from 760-790 m depth, whereas *M. bathybius* was collected in the Pacific from 3665-4000 m depth, and in the Northeast Atlantic from 1800-4310 m depth.

Myriotrochus rotulus n.sp.

Myriotrochus sp. – Cherbonnier 1969: 359-360, figs 6A-C.

MATERIAL EXAMINED. — **Northeast Atlantic.** Spain, West Galician coast, RV *Thalassa*, stn 485, 43°47'2N, 8°48'1W, depth 485 m, muddy sand with abundant globigerinas, 8.VIII.1967, holotype stored in the MNHN, No. EcHh 3420.

ETYMOLOGY. — From the Latin *rotula*, "small wheel".

DESCRIPTION

The holotype is a fragment of the body wall, 30 mm long. Skin is semitransparent; the colour in alcohol is whitish. Wheels are not very numerous and were found in only one part of the fragment. They lie in the skin separately, not overlapping. Wheels are not located in the papillae contrary to the observation of Cherbonnier (1969).

Wheel ossicles are represented by two types: typical myriotrochid wheels, and wheels with fused spokes. Typical myriotrochid wheels are not common and I could find only five of them. They are very small, only 70-80 µm in diameter (Fig. 5G-I). Parameters of the wheels of myriotrochid type are given in Table 4.

Wheels with fused spokes are represented by Fig. 5A-F. The spokes in this type of wheel are swollen in the middle portion, slightly nearer to the hub than to the rim. Sometimes, these swollen portions are fused leaving small oval holes near the hub. The number of these holes corresponds to the number of fused pairs of spokes and ranges from two up to the total number of spokes (Fig. 5A-D). In the last case a new large hub with a ring of small holes arises (Fig. 5A). These wheels are similar to the wheels of *Myriotrochus bathybius*. The wheels with fused spokes, 160-195 µm in diameter are more abundant, and are larger than myriotrochid wheels. Parameters of the wheels with fused spokes are given in Table 5.

DISCUSSION

The specimen has been previously described by Cherbonnier (1969) as *Myriotrochus* sp. However in the slide collection of Cherbonnier (MNHN

TABLE 5. — Parameters of the wheels of fused type of *Myriotrochus* (*Oligotrochus*) *rotulus* n.sp. See "Methods" for abbreviations.

Parameter	D (µm)	S	T	S/T (%)	Dhp (µm)	Dhp/D (%)	Dhs (µm)	Dhs/D (%)	Lo (µm)	Lo/D (%)	Lt (µm)	Lt/D (%)
	160	15			24	15.0	53	33.1			32	20.0
	160	15	25	60.0	23	14.4	50	31.3			38	23.8
	162	17	26	65.4	28	17.3	53	32.7			38	23.5
	170	17	24	70.8	30	17.6	55	32.4			38	22.3
	170	14	24	58.3	25	14.7	52	30.6			40	23.5
	170	14	24	58.3	25	14.7	50	29.4			38	22.4
	172	16	25	64.0	25	14.5					35	20.3
	175	16	33	18.9								
	180	16	24	66.7	30	16.7	60	33.3	15	8.3	40	22.2
	183	18	27	66.7	28	15.3	60	32.8	17	9.3	45	24.6
	185	17	27	63.0	30	16.2	53	28.6	17	9.2	40	21.6
	185	17	27	63.0	28	15.1	57	30.8			40	21.6
	190	17	26	65.4	25	13.2	55	28.9			38	20.0
	195	18	31	58.1	32	16.4	60	30.8			40	20.5
n	14	14	12	12	14	14	12	12	3	3	13	13
mean	175.5	16.2	25.8	63.3	27.6	15.71	54.8	31.23	16.3	8.94	38.6	22.03
σ	11.1	1.3	2.0	4.0	3.1	1.53	3.7	1.65	1.2	0.53	3.0	1.52

Paris) the slide with the calcareous ossicles of the holotype is labelled as "*M. rotulus*, sp.n.". The specimen itself was stored together with the specimens of *M. vitreus*. Apparently, at first, Cherbonnier was intending to describe the specimen as a new species, but later preferred to describe it without giving a new name, considering it to be close to *M. vitreus*. I prefer to keep the name used on the label by Cherbonnier. The opinion that this specimen belongs to a new species of *Myriotrochus* has been expressed by Belyaev & Mironov (1982, p. 111: "Undoubtedly this is a new species, close to *M. bathybius* Clark in wheel structure").

The specimen described is lacking its anterior end, so it is impossible to determine the number of tentacles. The close resemblance of fused type wheels to wheels with hub perforated by circle of holes, as in *Myriotrochus bathybius* and *M. neocaledonicus* n.sp., clearly points the great similarity between the new species and the species mentioned above. Thus, I prefer to place the new species in the twelve-tentacle genus *Myriotrochus* Steenstrup, 1851, rather than in the ten-tentacle genus *Prototrochus* Belyaev *et* Mironov, 1982, both genera having wheels of the myriotrochid type.

In some wheels, a quarter to third of the total number of teeth are merged with each other (Fig. 5E, F).

M. rotulus differs from all species of *Prototrochus* and *Myriotrochus* in having wheels with "fused spokes" besides wheels of the typical myriotrochid type. In *M. rotulus* these wheels usually have less hub perforations than spokes because not all of the spokes are fused. This character clearly distinguishes the new species from *M. bathybius* and *M. neocaledonicus* (see H. L. Clark 1920; Gage & Billett 1986). *M. rotulus* also differs from these species in having smaller wheels.

KEY TO SPECIES OF THE SUBGENUS *Oligotrochus*

1a. Wheels of typical myriotrochid type with whole hub; ventral pieces of the calcareous ring two times higher than dorsal pieces 2

1b. Wheels with hub penetrated by a completely or partly developed circle of perforations; sometimes typical myriotrochid wheels with whole hub also occur 3

2a. Diameter of wheels 50-90 µm; average S/T ratio 59-61%; tentacles with four to five pairs of lateral digits .... *M.* (*O.*) *vitreus* M. Sars, 1866

2b. Diameter of wheels 56-244 (mean 122) µm; average S/T ratio 49%; tentacles with two pairs of lateral digits .... *M.* (*O.*) *clarki* Gage *et* Billett, 1986

3a. Wheels 160-195 µm in diameter with spokes swollen in their middle portion; some of these swollen portions are fused to each other leaving small oval perforations near the hub; the number of these perforations correspond to the number of fused pairs of spokes and ranges from two up to the total number of spokes ... *M.* (*O.*) *rotulus* n.sp.

3b. Wheels 120-450 µm in diameter with hub penetrated by a complete circle of perforations 4

4a. Average ratio Lo/D 6.5-6.7%; tentacles with three to four digits on each side .... *M.* (*O.*) *bathybius* H. L. Clark, 1920

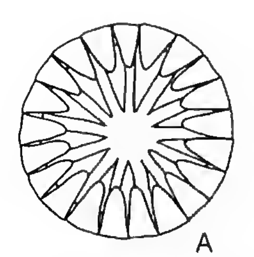
4b. Average ratio Lo/D 4.4%; tentacles do not have (?) lateral digits .... *M. neocaledonicus* n.sp.

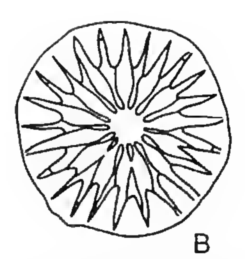
CONCLUSION

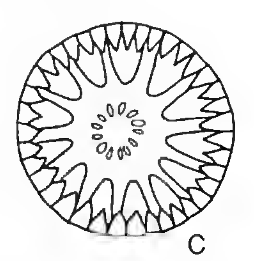
My own studies on the morphology of wheels and calcareous rings in the genus *Myriotrochus* have convinced me that *M. vitreus* (M. Sars, 1866), *M. clarki* (Gage *et* Billett, 1986), *M. rotulus* n.sp., *M. bathybius* H. L. Clark, 1920 and *M. neocaledonicus* n.sp. are closely related. All these species have conical tentacles bearing small lateral digits of the quasi "peltate" type (except for *M. rotulus*, the head part of this species being unknown) which are quite different from the tentacles of the "peltato-digitate" type characteristic of *M. rinkii*, the type species of the genus *Myriotrochus* and correspondingly the type species of the nominotypical subgenus *Myriotrochus*. Hence, the character proposed by Heding to separate the subgenus *Oligotrochus* characterizes this above mentioned group of species.

The main diagnostic characters used in the taxonomy of the subgenus *Oligotrochus* are the form of the wheels, the calcareous ring structure, and the number of tentacle digits.

The origin of wheels with the hub perforated by a circle of holes, which is typical of *M. bathybius* and *M. neocaledonicus*, is obvious. The large hub with the circle of perforations is the result of the fusing of the swollen middle part of the spokes. One can easily observe this fusion *in statu nascendi* in the wheels of *M. rotulus*. We find all the







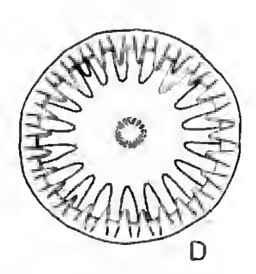


FIG. 6. — A morphological series which illustrates the origin of the wheels with wide hub perforated by a circle of holes; **A**, *Myriotrochus* (*Oligotrochus*) *vitreus* (M. Sars, 1866) (after Heding 1935, fig. 3-1); **B**, *M.* (*O.*) *rotulus* n.sp.; **C**, *M.* (*O.*) *bathybius* H. L. Clark 1920, pl. 4, fig. 3; **D**, *M.* (*O.*) *neocaledonicus* n.sp.

transitional forms, from wheels with only two holes to wheels with a complete circle of perforations (Fig. 5A-D). It is interesting to note that typical myriotrochid wheels also occur in this species, though they are not as abundant as wheels with fused spokes. H. L. Clark (1920: 126-127) found developing wheels in *M. bathybius* and described this process: "When the length of the spokes is somewhat greater than the diameter of the original hub, a swelling appears near the middle of each spoke and as these swellings widen they come in contact and fuse with each other, leaving the circle of small oval holes, which apparently never fill up." In one Northeast Atlantic specimen, Gage & Billett (1986: 236, fig. 4) also found the different stages of development from the typical myriotrochid wheels to wheels with hub perforated by a circle of holes. Thus, the development of wheels typical of *M. bathybius* reflects the origin of wheels with perforated hub. It is also interesting to note that in *M. clarki* Gage & Billett (1986: 252, fig. 16A, B) found that "the large wheels showing fusion of adjacent spokes around the hub, resulting in a greatly enlarged central part of the wheel, are reminiscent of *M. bathybius*. They differ from the latter species in lacking a ring of small oval perforations around the hub." This indicates that species of the subgenus *Oligotrochus* have a tendency to form wheels with wide hub resulting from the fusion of the distal parts of the spokes. Possibly, this process is connected with the large size of the wheels. The material examined allows to describe a morphological series which illustrates the origin of the wheels with wide hub perforated by a circle of holes (Fig. 6). This series can be regarded as a polarized transformation series in the terms of cladistic systematics. The small typical myriotrochid wheels of *M. vitreus* are placed at the beginning of this series. The following stages are represented by the different wheels of *M. rotulus*, which demonstrate all intermediate stages of the fusion of the middle portion of the spokes, a fusion ranging from two to all spokes. The next stage is represented by the wheels of *M. bathybius* which have a complete circle of oval perforations. The wheels of *M. neocaledonicus*, which have a circle of very small triangular perforations, complete the series. A side branch of this morphological series was found in only one specimen of *M. clarki*, which is represented by wheels with wide hub produced by the complete fusion of adjacent spokes around the primary hub.

The calcareous ring having considerable differences in height between the ventral and dorsal pieces, and large posterior processes, which is characteristic of *M. vitreus* and *M. clarki*, is to be regarded as a derived character. This character separates those species from *M. bathybius* and *M. neocaledonicus* which have a more simple structure of the calcareous ring.

A tentacle with three to five pairs of lateral digits is to be considered as a primitive character. Tentacles with one or two pairs of digits, or without digits, is a more advanced character which can be easily derived independently.

Possible phylogenetic relationships of the species of the subgenus *Oligotrochus*, based on wheel shape, difference between dorsal and ventral pieces of the calcareous ring and number of tentacular digits, are represented in Figure 7.

The characters of the calcareous ring and wheel structure indicate that there are two groups of species, the first including *M. vitreus* and *M. clarki*, the second *M. bathybius* and *M. neocaledonicus*. In the first group *M. clarki* is apparently more advanced than *M. vitreus* because the

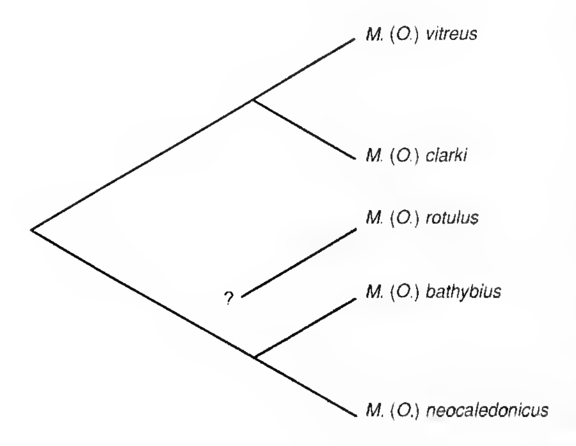


Fig. 7. — Possible phylogenetic relationships of the species of the subgenus *Oligotrochus*, based on wheel shape, difference between dorsal and ventral pieces of the calcareous ring and number of tentacular digits.

former species has larger wheels, sometimes with wide hub, and tentacles with only one or two pairs of digits. In the second group, *M. neocaledonicus* having small triangular holes in the hub of the wheels, and being without lateral tentacle digits (the last character requires confirmation with new material) is apparently more advanced. *M. vitreus* and *M. clarki* seem to be related with *M. bathybius* and *M. neocaledonicus*. The latter pair is characterized by evolved type of wheels with hub perforated by a circle of holes. Nevertheless, the first pair of species, which have primitive wheels, cannot be considered the ancestor of the *M. bathybius-M. neocaledonicus* group because *M. vitreus* and *M. clarki* have the advanced type of calcareous ring. Unfortunately, because the data on the structure of the calcareous ring and tentacles of *M. rotulus* are missing the relationship of this species to others cannot be determined. Wheel characters of *M. rotulus* suggest that it is more closely related to the *M. bathybius-M. neocaledonicus* group.

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The lynx and nursery-web spider families in Israel (Araneae, Oxyopidae and Pisauridae)

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Levy G. 1999. — The lynx and nursery-web spider families in Israel (Araneae, Oxyopidae and Pisauridae). *Zoosystema* 21 (1) : 29-64.

ABSTRACT

The lynx spiders genera *Oxyopes* Latreille, 1804 and *Peucetia* Thorell, 1869 and the nursery-web spiders of the genera *Pisaura* Simon, 1885 and *Rothus* Simon, 1898 in Israel are revised. These versatile hunters form a conspicuous component of the Middle East vegetation-dwelling spider fauna. *Oxyopes* is represented by nine species. Only three out of these were formerly reported while the unknown female of one (*O. sobrinus* O. P.-Cambridge, 1872) is described here for the first time. Three are new species: *O. nanulineatus*, *O. sinaiticus* and *O. mediterraneus*, and three others constitute new records of species with rather disjunct distributions. *Oxyopes optabilis* O. P.-Cambridge, 1872 is newly synonymized with *O. heterophthalmus* (Latreille, 1804), whereas *O. attica* Hadjissarantos, 1940, *O. maracadensis* Charitonov, 1946, and *O. eymiri* Karol, 1967 are new synonyms of *O. globifer* Simon, 1876. *Peucetia* was known from Israel only by *P. virescens* (O. P.-Cambridge, 1872), however, the male is illustrated here fot the first time. Two additional *Peucetia* species form new records. The possibly endemic *Pisaura consocia* (O. P.-Cambridge, 1872) and the taxonomically problematic Palearctic *P. mirabilis* (Clerck, 1757) are addressed, and the first representative in Asia of the African genus *Rothus* is described.

KEY WORDS
Araneae,
Oxyopes,
Peucetia,
Pisaura,
Rothus,
Middle East.

RÉSUMÉ

Les familles d'araignées Oxyopidae et Pisauridae d'Israël.

Les genres *Oxyopes* Latreille, 1804 et *Peucetia* Thorell, 1869 (araignées-lynx) ainsi que les genres *Pisaura* Simon, 1885 et *Rothus* Simon, 1898 (qui construisent des « toiles pouponnières ») d'Israël sont révisés. Ces araignées prédatrices représentent une importante partie de la faune qui peuple les buissons du Moyen-Orient. *Oxyopes* est représenté par neuf espèces. Trois d'entre elles seulement étaient connues jusqu'ici. La femelle de *O. sobrinus* O. P.-Cambridge, 1872 est décrite ici pour la première fois. Trois nouvelles espèces sont également décrites : *O. nanulineatus*, *O. sinaiticus* et *O. mediterraneus*. Trois autres ont été récoltées dans des aires où elles n'avaient pas été signalées auparavant. *Oxyopes optabilis* O. P.-Cambridge, 1872 a été récemment reconnu synonyme de *O. heterophthalmus* (Latreille, 1804), tandis que *Oxyopes attica* Hadjissarantos, 1940, *O. maracadensis* Charitonov, 1946 et *O. eymiri* Karol, 1967 sont identifiées à *O. globifer* Simon, 1876. Le mâle de *Peucetia virescens* (O. P.-Cambridge, 1872) (seule espèce connue d'Israël jusqu'ici) est décrit pour la première fois. Deux espèces de *Peucetia* s'ajoutent à la liste. *Pisaura consocia* (O. P.-Cambridge, 1872) probablement endémique, et l'espèce paléarctique *P. mirabilis* (Clerck, 1757) sont mentionnées et le premier représentant en Asie du genre africain *Rothus* est décrit.

MOTS CLÉS
Araneae,
Oxyopes,
Peucetia,
Pisaura,
Rothus,
Moyen-Orient.

INTRODUCTION

Adults of the spider families Oxyopidae and Pisauridae in Israel are cursorial hunters that are usually found among vegetation. All are three-clawed and armed with serrated bristles for handling silk and their young may construct webs at certain stages. In tropical and southern parts of the world the adults of some members of these families are known as sedentary web-builders (Lawrence 1964; Griswold 1983; for additional references see Shear 1986). A possible evolutionary shift from web weavers to hunters has been suggested by Rovner (1980) and further elaborated by Jackson (1986). Each of the two families comprises several hundred species in the world. With populations occasionally rather abundant, they constitute an important component of the vegetation-dwelling spider guild. The spider families considered here along with a former study on the funnel-weavers, the Agelenidae of Israel (Levy 1996), provide an updated profile of the main spider communities of the low-shrub and herbaceous plants in Israel.

Out of the twelve oxyopids known at present from Israel only four have been previously recorded here. In addition three new species are described along with the unknown female of a species described over 120 years ago. Five species prove to be new records from Israel, in part new for the entire Middle East, providing clues for zoogeographic patterns reaching far beyond the regional scope. Among the latter are records of species known thus far only from Yemen or the Badhyz Desert in Turkmenia.

Considering the Israeli pisaurids these may blend with the vegetation by their colour but are easily detected while they seem to roll over a disproportionate large egg-sac held underneath their body or by their often conspicuous nursery-webs. The two *Pisaura* species found in Israel include a possible endemic. In addition the first occurrence in Asia of a representative of the African genus *Rothus* is reported.

MATERIAL AND METHODS

The present study is based on material deposited in the collections of the Hebrew University of Jerusalem (HUJ). Localities in Israel are listed from north to south and co-ordinates (Israel grid) are given for less well-known places. Drawings are of specimens from Israel, unless otherwise indicated. Measurements (mm) from preserved adult specimens, ten of each sex if available, are given and ranges are stated. The length of the leg given is the combined length of all segments (each measured separately) from femur to tarsus; the more proximal segments are excluded. The proportional indices used are given in "Abbreviations" (see below). The leg formula indicates the longest leg by the first digit and the shortest by the last. Taxonomic references to taxa include, among others, those accompanied by useful illustrations not listed in the current araneological catalogues.

Abbreviations

HECO	Hope Entomological Collections, University Museum, Oxford, U. K.;
HUJ	Hebrew University of Jerusalem, Israel;
MNHN	Muséum national d'Histoire naturelle, Paris, France;
NMW	Naturhistorisches Museum, Vienna, Austria;
SMF	Natur-Museum und Forschungs-Institut Senckenberg, Frankfurt, Germany:
ZMUM	Zoological Museum of the Moscow State University, Russia.

AME	anterior median eye;
carapace index	length divised by width;
clypeus index	height of clypeus divided by diameter of anterior median eye;
MOQ	Median Ocular Quadrangle (measured in profile from frontal edges of AME to hind edges of PME);
MOQ/cly	longitudinal axis of MOQ divided by clypeus height;
patella-tibia index	combined length of both segments of leg-I divided by length of carapace.
PME	posterior median eyes;
PM index	space between PME eyes divided by diameter of one PME.

SYSTEMATICS

Family Oxyopidae Thorell, 1870

Remarks

The lynx spiders are usually taken by sweeping vegetation. They are easily recognized among the plant-dwelling spiders by the many erect spines on their legs and the peculiar hexagonal eye arrangement. The carapace is high and convex, sloping sharply at the sides and has a vertical clypeus in front. All possess eight eyes. Legs are with notched trochanters and three claws, two of them pectinate. They have three pairs of spinnerets and a colulus. The opisthosoma usually tapers to a pointed end. Two genera are present in Israel.

Genus *Oxyopes* Latreille, 1804

Type species. — By monotypy: *Oxyopes heterophthalmus* Latreille,1804.

Description

Medium-sized spiders, usually less than 10 mm in body length. Blackish to light coloured, but not green, occasionally tinted with red. Integument densely covered with flattened scales and scattered ordinary setae. Carapace longer than wide (Fig. 1A). Anterior row of eyes strongly recurved with anterior-medians much smaller than anterior-laterals (Fig. 1A, B). Posterior row of eyes clearly procurved. Distance between anterior-lateral eyes subequals distance between posterior-median eyes (outlined rectangular, Fig. 1B). Eyes of posterior row placed at subequal distances. Inner distance between posterior-median eyes much longer than diameter of a posterior-median eye. Labium longer than wide and exceeded in length by the palpal endites (Fig. 1D). Chelicerae usually with one promarginal and one retromarginal tooth (Fig. 1E). Legs long and spinous. Leg formula: IV, I, II, III or I, IV, II, III or I, II, IV, III. Opisthosoma oval, often with a median mark on dorsum and venter. Tibia of male palpus short and armed with apophyses, sometimes markedly enlarged (Fig. 2A, B); bulbus with median, fleshy, tegular outgrowth rising up to tip of embolus (Figs 4A, B, 18A, B); no paracymbium. Female

epigynum usually with raised, tongue-like, median extension, often protruding in profile (Figs 3A, B, 8A, B, 15A, B).

Remarks

Over two hundred *Oxyopes* species, mainly from the warmer parts of the world, are catalogued, but many are known only by their first description. *Oxyopes* species are generally considered diurnal, versatile active foragers or they may take to sit-and-wait strategies. They are often seen running, making erratic moves and jumps in herbaceous vegetation. An american species is found also on woody vegetation: conifers and deciduous trees (Brady 1964: 490). At night they have been observed to be immobile, suspended by a thread of silk from the underside of leaves and apparently are best collected by sweeping at night (Lowrie 1971: 349). The copulatory behaviour of *Oxyopes* comprises long courtship followed by very brief mating while hanging inverted on a silken thread (Gerhardt 1933; Cutler *et al.* 1977). The large, unique tibial apophysis of the male palpus of *O. heterophthalmus* often breaks off and is found stuck inside the epigastric furrow of the female, below the epigynal plate (not inside notches on the epigynum). Its breaking occurs possibly during a sudden partly circular turn made by the male while mating (Gerhardt 1933: 29). Evidently, the male holotype of *O. optabilis* O. P.-Cambridge, 1872 turned out to be an *O. heterophthalmus* male in which both palpi have amputated tibial apophyses. The whitish, flattened, lenticular egg-sac is fastened firmly to twigs of shrubs or gramineous stalks and is guarded by the female (Berland 1927: 20). The young emerge after three to four weeks and the female may then lay another egg-sac. The female may eat while on guard (Jennings & Pase 1975) or not feed during this period of time (Berland 1927).

Three species of *Oxyopes* have been previously reported from Israel: *lineatus* (as *gentilis*), *heterophthalmus* and *sobrinus*. The female of the latter is described here for the first time. In addition there are three new records for the Middle East: *globifer*, *pigmentatus* and *badhyzicus*, and three are new species, namely *mediterraneus*, *nanulineatus* and *sinaiticus*. There is a close resemblance among *lineatus*, *nanulineatus*, *sobrinus* and *sinaiticus* representing apparently a common evolutionary line, differing from that formed by *globifer* and *mediterraneus*, whereas *heterophthalmus*, *pigmentatus* and *badhyzicus* belong each to a separate line.

Distinctions by colours, found in old descriptions are useless since nearly all shades, from yellow to almost black may appear in a single population. Two names of doubtful application were given to Egyptian species that cannot be traced in collections nor are they identifiable by their descriptions: *Sphasus alexandrinus* Audouin, 1826 and the immature *Oxyopes bilineatus* O. P.-Cambridge, 1876. Considering the occurrence of several species of close resemblance in xeric habitats of the Middle East, these names should thus be regarded as *nomina dubia*.

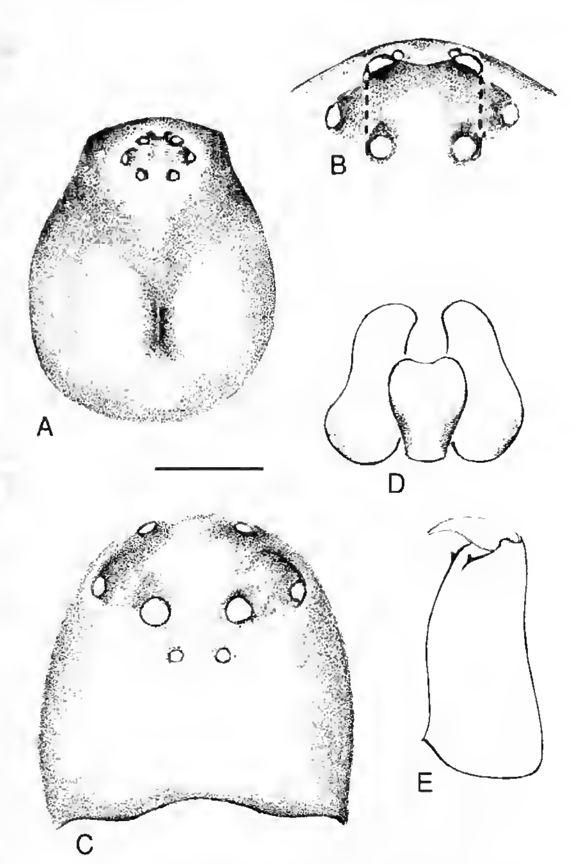


Fig. 1. — *Oxyopes*, **A**, carapace, dorsal view; **B**, eye arrangement, dorsal view, detail; characteristic rectangle outlined; **C**, eye arrangement, frontal view; **D**, labium and palpal endites; **E**, left chelicera, inner view. Scale bar: A, 1 mm; B-E, 0.5 mm.

Oxyopes heterophthalmus (Latreille, 1804) (Figs 1-3)

Aranea heterophthalma Latreille, 1804b: 280; type from France, presumably lost.
Oxyopes heterophthalmus – Latreille 1804a: 135. – Roewer 1954a: 318. – Bonnet 1958: 3229. – Brady 1964: figs 100, 101. – Azheganova 1968: 42, figs 64, 65. – Loksa 1969: 128, fig. 86a, b. – Platnick 1989: 430; 1993: 589.
Oxyopes optabilis O. P.-Cambridge, 1872: 315; ♂ holotype (with broken tibial apophyses of palpi) from the Plains of the Jordan, Israel (HECO, B.808, t.8; examined); syn.n.

DIAGNOSIS. — The unique structure of the tibial apophyses of the male palpus and the large epigynal cone of the female with the coiled spermathecae, distinguish *O. heterophthalmus* easily from all other *Oxyopes* species.

DISTRIBUTION. — Palearctic.

RECORDS. — Israel from Mt. Meron in the Galilee to the Judean Hills and down to Jericho.

DESCRIPTION

Male

Measurements (10 ♂♂): total length 5.4-7.2; carapace length 2.6-3.2, width 2.0-2.4, index 1.26-1.30; clypeus index 5.67-7.0; MOQ/cly ratio 1.21-1.47; PM index 1.77-2.08; leg

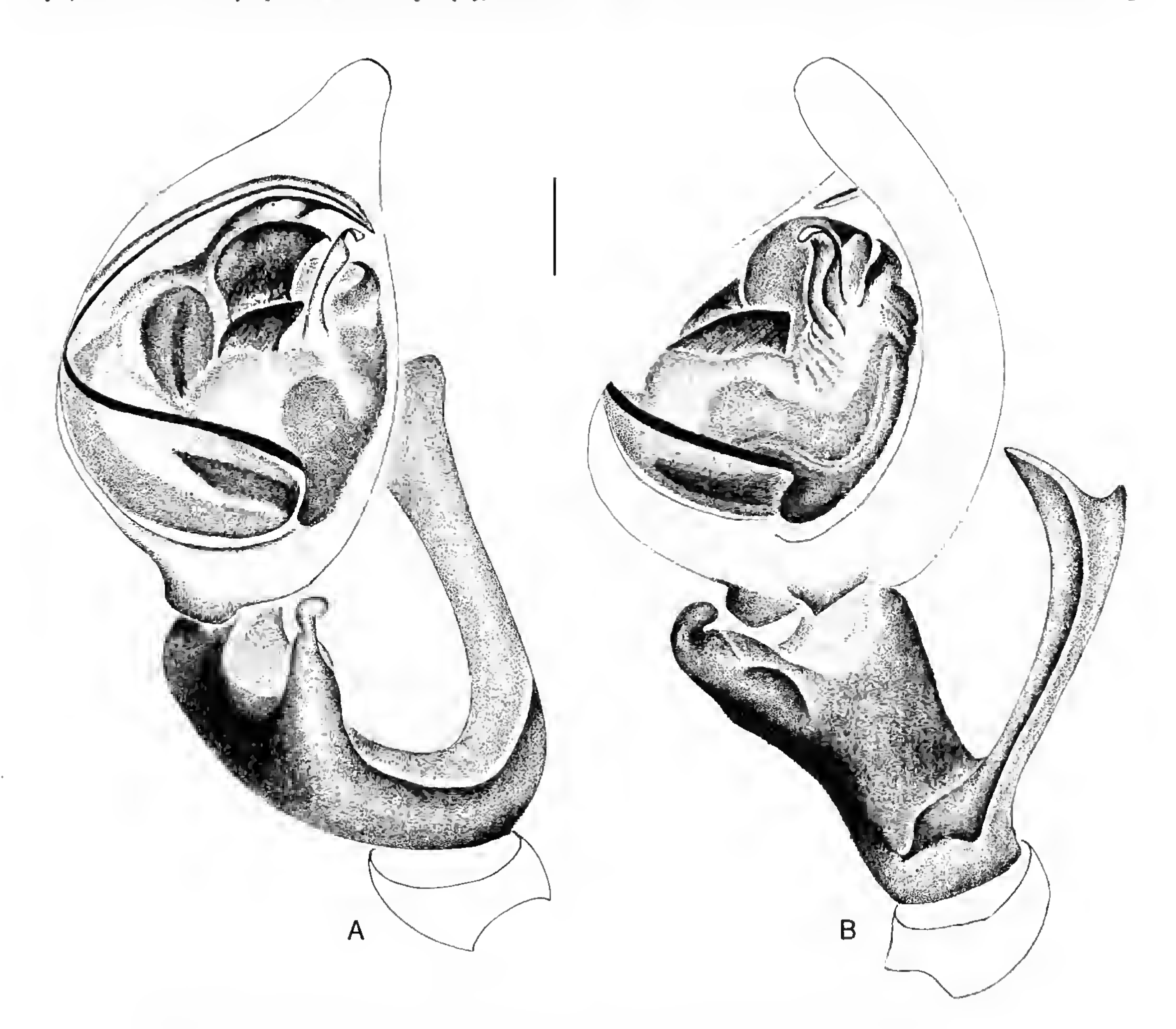


FIG. 2. — *Oxyopes heterophthalmus* ♂, left palpus; **A**, ventral view; **B**, retrolateral view. Scale bar: 0.25 mm.

lengths: I 9.7-13.3, II 9.0-11.6, III 7.2-9.4, IV 8.1-10.6; patella-tibia index 1.19-1.46.

Palpus. Tibia with short ventral apophysis and big, laterally bent, sclerotic apophysis that often breaks off at base (Fig. 2A, B); bulbus basally traversed by long, filiform embolus running apically along mesal side; bulbus at centre armed with thick, slightly rugged blackish process, ridged brown lamella and whitish tegular outgrowth (Fig. 2A, B).

Female

Measurements (10 ♀♀): total length 6.5-10.5; carapace length 2.8-3.8, width 2.1-3.0, index 1.25-1.38; clypeus index 6.4-9.2; MOQ/cly ratio 1.01-1.24; PM index 1.75-2.26; leg lengths: I 10.0-13.3, II 9.1-12.5, III 7.5-10.3, IV 8.5-11.8; patella-tibia index 1.09-1.31.

Epigynum. Relatively large with flattened, cone-like, sclerotic extension rising at middle (Fig. 3A, B). Spermathecae contain narrow, tightly coiled tubes (Fig. 3C).

COMMENTS

Oxyopes heterophthalmus which lives in the heat of Jericho, the lowest point on Earth, and extends as far as England, should be considered an out-standing adaptive species. Adult males were collected in Israel from February to April and females from March to May. Courtship of specimens from Jerusalem was observed in April (Gerhardt 1933: 28). The first records of *O. heterophthalmus* from Israel are by O. P.-Cambridge (1872: 314; as *O. lineatus* Walckenaer, not Latreille 1806; ♂♂ and ♀♀ HECO, B.808, t.6; examined) followed by his (1872: 315) amputated *O. optabilis*. Further records of *optabilis* from Syria and Libya (Bonnet 1958: 3236) are considered unacceptable. Additional previous records of *O. heterophthalmus* from Israel are by Pavesi (1895: 8) and Strand (1913: 162), and from Syria by Kerville (Damascus 1926: 70).

Oxyopes heterophthalmus serves as the type-species of *Oxyopes*, but the peculiar palpal structures of the male and the shape of the spermathecae of the female shared by the closely related, Central Russian *O. takobius* Andreeva *et* Tyschenko, 1969 and the Chinese *O. foliiformis* Song, 1991 place these in a secluded position among the numerous known *Oxyopes* species. Future revisions may thus result in excluding most species currently included in *Oxyopes*.

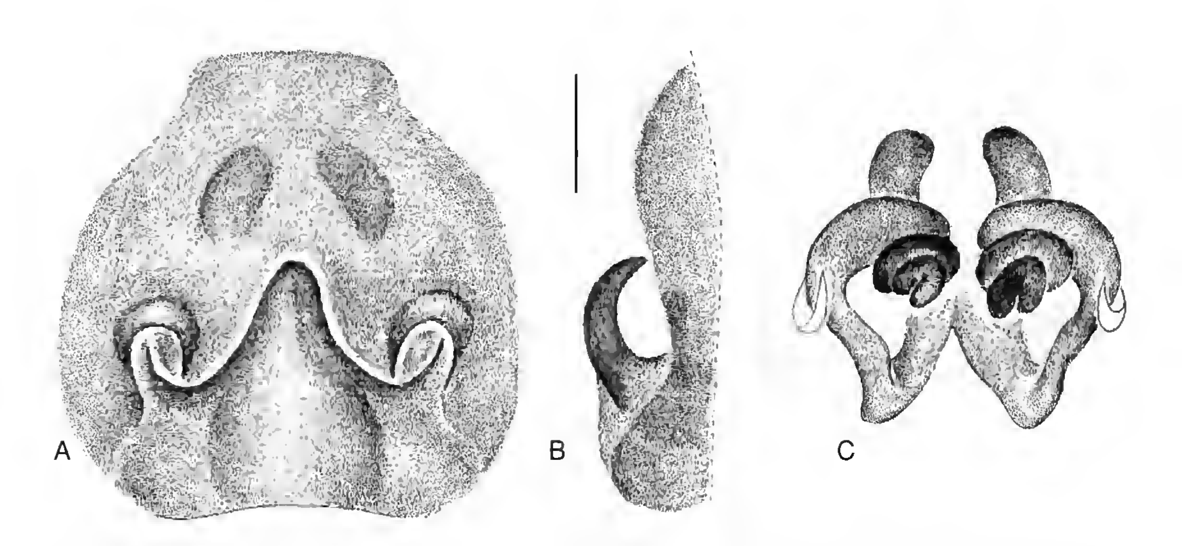


FIG. 3. — *Oxyopes heterophthalmus* ♀; **A**, epigynum, ventral view; **B**, epigynum, lateral view; **C**, spermathecae, dorsal, inner view. Scale bar: 0.25 mm.

Oxyopes lineatus Latreille, 1806 (Figs 4, 5)

Oxyopes lineatus Latreille, 1806: 117, pl. 5, fig. 5; type from France, presumably lost. – Roewer 1954a: 319. – Bonnet 1958: 3233. – Loksa 1969: 128, fig. 86c, d. – Brignoli 1977: 74, figs 42, 43. – Barrientos 1984: 153, figs 1a-c, 2. – Weiss 1989: 1, figs 1-4, 9-13. – Heimer & Nentwig 1991: 352, fig. 914.

DIAGNOSIS. — The shape of the male palpus with the elongated bulbus, the basally notched cymbium, the shape of the tegular and tibial apophyses and the shape of the tongue-like, elongated epigynal extension

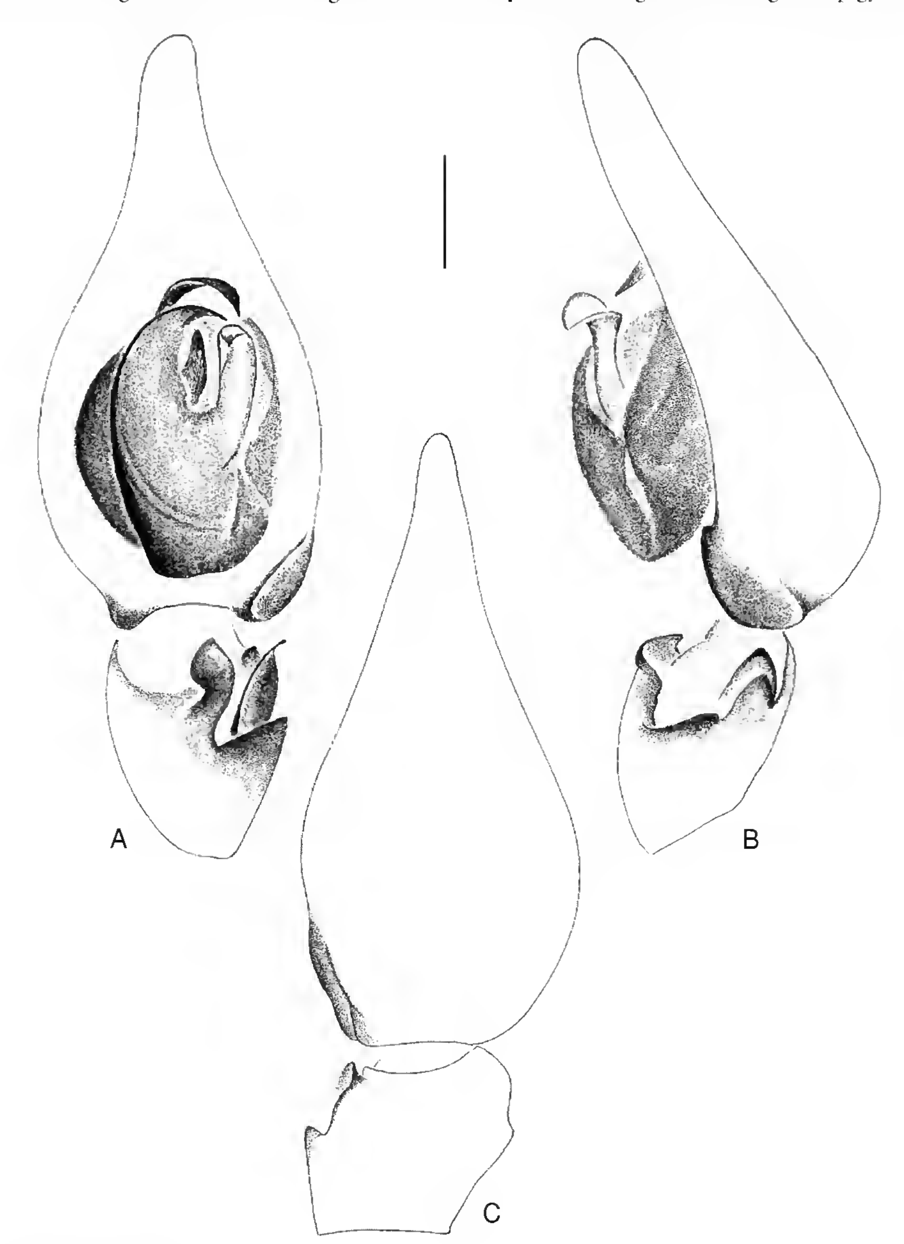


FIG. 4. — *Oxyopes lineatus* ♂, left palpus; **A**, ventral view; **B**, retrolateral view; **C**, dorsal view. Scale bar: 0.25 mm.

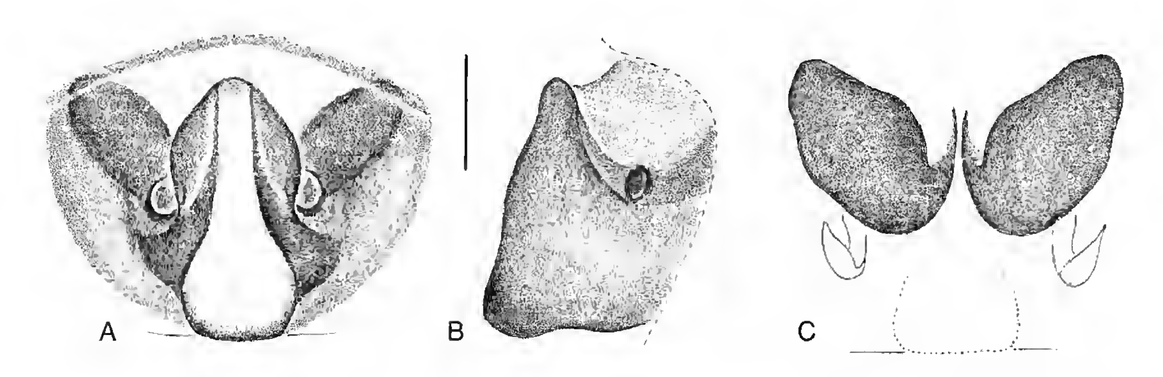


Fig. 5. — *Oxyopes lineatus* ♀; **A**, epigynum, ventral view; **B**, epigynum, lateral view; **C**, spermathecae, dorsal, inner view. Scale bar: 0.1 mm.

of the female are characters that distinguish *O. lineatus* from all other *Oxyopes* species.

Distribution. — Southern Europe to Russia, Syria, Lebanon, Israel.

Records. — Israel, in the mountainous parts from the foothills of Mt. Hermon to the Judean Hills.

Description

Male

Measurements (10 ♂♂): total length 4.2-6.2; carapace length 2.1-2.8, width 1.5-2.1, index 1.27-1.42; clypeus index 4.86-6.22; MOQ/cly ratio 1.45-1.97; PM index 1.7-2.0; leg lengths: I 7.8-12.3, II 7.0-11.0, III 5.8-8.7, IV 6.7-10.5; patella-tibia index 1.19-1.48.

Palpus. Bulbus elongated. Cymbium much extended apically, with clear concavity on basalectal side (Fig. 4A-C); thick tip of embolus bends under blackish tip of conductor (Fig. 4A); bulbus medially bears brown, sclerotized process projecting alongside whitish, tegular outgrowth (Fig. 4A). Apical edges of scooped tibia extend into partly spiriferous ventral apophysis and retrolateral protrusions (Fig. 4A, B).

Female

Measurements (10 ♀♀): total length 5.1-7.2; carapace length 2.4-3.1, width 1.8-2.3, index 1.30-1.44; clypeus index 5.9-6.8; MOQ/cly ratio 1.25-1.59; PM index 1.8-2.0; leg lengths: I 8.5-11.8, II 7.8-10.9, III 6.4-8.9, IV 7.8-10.5; patella-tibia index 1.19-1.28.

Epigynum. Elongated, light median tongue-like extension nearly twice as long as wide, flanked on sides by transparent membranes (Fig. 5A); median elevated extension nearly quadrate in profile (Fig. 5B). Spermathecae consist of compact bodies (Fig. 5C).

Comments

Adult males were collected in Israel in May-June and females from April to June. The occurrence in the Middle East of *O. lineatus* was noted formerly by O. P.-Cambridge (1872: 314; as *gentilis*, ♂♂ and ♀♀ from Nazareth, Israel, and Beirut, Lebanon, HECO, B.808, t.2; examined), Pavesi (1895: 8; as *transalpinus*, from Lebanon), Kerville (1926: 70, from Syria and Lebanon) and Brignoli (1978a: 207, from Lebanon). Examination of numerous specimens from France (MNHN, B.2258, n° 692) corroborrated the above identification. *Oxyopes lineatus* is found in Israel only in the mesic central and northern parts and is thus considered a North Mediterranean element of this fauna. Whether and where it occurs in northern Africa (Bonnet 1958: 3235) should be re-investigated. Evidently, there are several species, including some described below, that inhabit arid or semi-arid habitats and could be mistaken for *O. lineatus*.

Oxyopes nanulineatus n.sp.
(Fig. 6)

Holotype. — Adult ♀ from near the inflow of River Jordan into Lake Kinneret (2080/2555), Israel, *leg.*

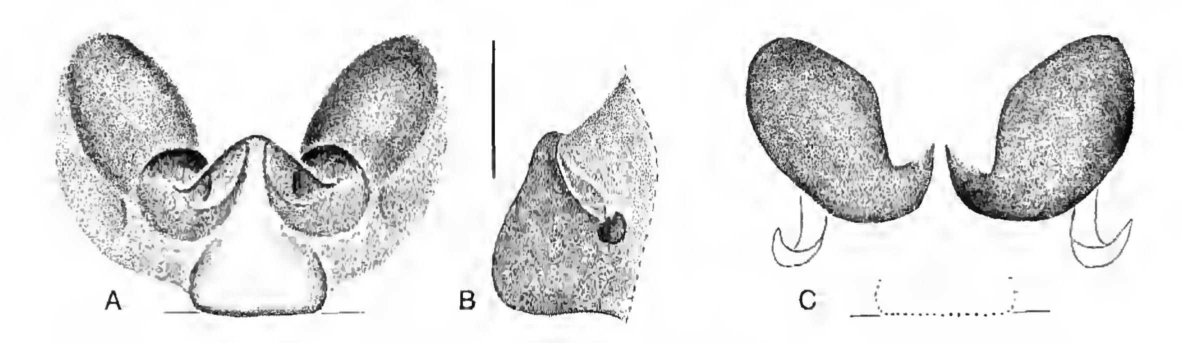


FIG. 6. — *Oxyopes nanulineatus* n.sp. ♀, holotype; **A**, epigynum, ventral view; **B**, epigynum, lateral view; **C**, spermathecae, dorsal, inner view. Scale bar: 0.1 mm.

G. Levy, 24.VI.1973 (HUJ 15146); ♂ paratype with same data (HUJ 15147).

ETYMOLOGY. — The specific name denotes the small size (nanos = dwarf), and the close relationship between this species and *O. lineatus*.

DIAGNOSIS. — *Oxyopes nanulineatus* is a compact, dwarf form that resembles *O. lineatus* very closely. Although the males, apart from their size, cannot be separated by their palpal configuration from *O. lineatus*, the females can be distinguished by the different shape of the epigynal plate. The two apparently are allopatric and do not share the same ecological niche. *Oxyopes nanulineatus* so far has been found only near water, a habitat where no *O. lineatus* has been taken.

DISTRIBUTION. — Israel.

RECORDS. — Israel, HaGoshrim, pond at Bab el-Hawa (Golan Hights), Jordan inflow into Lake Kinneret, inflow of Nahal Samakh into Lake Kinneret, Bet Yosef on banks of river Jordan.

DESCRIPTION

Male

Measurements (4 ♂♂); total length 3.7-4.0; carapace length 1.8-1.9, width 1.4-1.5, index 1.26-1.36; clypeus index 3.50-3.75; MOQ/cly ratio 2.20-2.25; PM index 1.5-1.6; leg lengths: I 6.9-7.4, II 6.2-6.6, III 5.0-5.3, IV 5.9-6.4; patella-tibia index 1.21-1.39.

Palpus. Shape of bulb and tibia like *O. lineatus* but in miniature.

Female

Measurements (of holotype + 7 ♀♀; holotype listed first): total length 5.1, 3.9-5.2; carapace length 2.2, 1.9-2.4, width 1.6, 1.3-1.8, index 1.38, 1.27-1.46; clypeus index 5.13, 4.44-5.11; MOQ/cly ratio 1.78, 1.67-1.97; PM index 1.8, 1.5-1.9; leg lengths: I 7.3, 6.2-8.3, II 7.0, 5.8-7.9, III 6.2, 4.8-6.7, IV 7.0, 5.5-7.9; patella-tibia index 1.18, 1.11-1.28.

Epigynum. Short, central elevated portion about as wide as long; membranous edges extend inwards into blackish orifices (Fig. 6A); median elevation viewed in profile (Fig. 6B). Structure of spermathecae (Fig. 6C).

COMMENTS

Adults were collected in March, June and July. A similar phenomenon of a riparian species in which merely the females can be separated from a closely resembling species living away from water is known in the funnel-weavers *Agelescape livida* (Simon, 1875) and *A. affinis* (Kulczyński, 1911) (see Levy 1996).

Oxyopes sobrinus O. P.-Cambridge, 1872 (Figs 7, 8)

Oxyopes sobrinus O. P.-Cambridge, 1872: 314; ♂ holotype from the Plains of the Jordan, Israel (HECO, B.808, t.3; examined).

DIAGNOSIS. — *Oxyopes sobrinus* resembles *O. lineatus* superficially but is easily distinguished also from other *Oxyopes* species by the male palpus with the peculiar median protuberance, by the form of the tegular outgrowth and by the shape of the tibial apophyses as well as by the shape of the median epigynal elevation of the female with the projections on the sides.

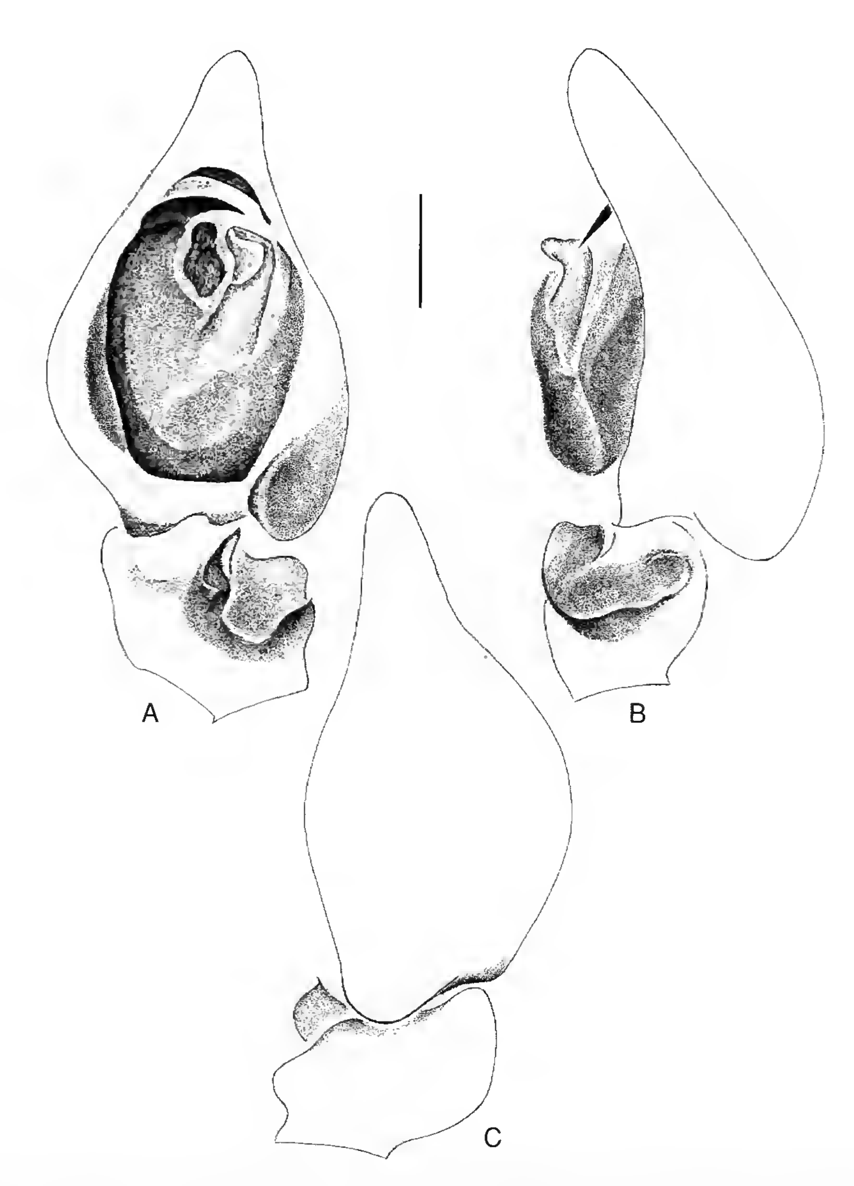


FIG. 7. — *Oxyopes sobrinus* ♂, left palpus; **A**, ventral view; **B**, retrolateral view; **C**, dorsal view. Scale bar: 0.25 mm.

DISTRIBUTION. — Israel; Libya, needs verification.

RECORDS. — Israel, Dead Sea area, Arad, Sede Boqer and surroundings, Makhtesh Ramon.

DESCRIPTION

Male

Measurements (10 ♂♂): total length 4.4-6.2; carapace length 2.2-3.2, width 1.7-2.5, index 1.22-1.35; clypeus index 3.80-5.09; MOQ/cly ratio 1.71-1.98; PM index 1.5-1.9; leg lengths: I 7.7-11.3, II 7.4-9.9, III 5.2-8.5, IV 7.5-10.5; patella-tibia index 1.13-1.25.

Palpus. Cymbium expanded at basal-ectal corner (Fig. 7A-C); thick end of embolus bends under black tip of conductor; bulbus bears medially a brownish massive protuberance partly surrounded by whitish tegular outgrowth (Fig. 7A);

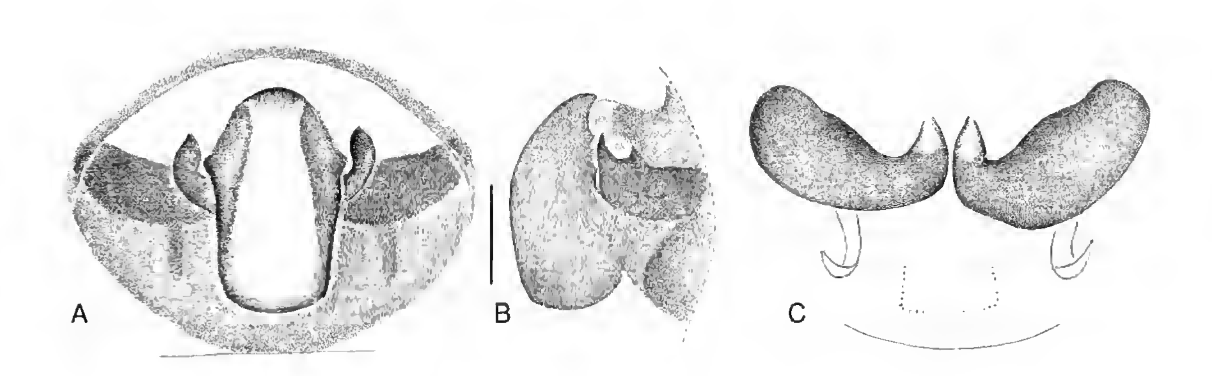


FIG. 8. — *Oxyopes sobrinus* ♀; **A**, epigynum, ventral view; **B**, epigynum, lateral view; **C**, spermathecae, dorsal, inner view. Scale bar: 0.1 mm.

apical edges of scooped tibia extend on mesal side into raised, partly transparent expansion (Fig. 7A, B).

Female

Measurements (9 ♀♀), total length 5.7-9.4; carapace length 2.5-3.6, width 1.9-2.6, index 1.30-1.43; clypeus index 4.7-6.2; MOQ/cly ratio1.33-1.77; PM index 1.4-1.9; leg lengths: I 8.5-11.9, II 7.7-11.5; III 6.1-9.8, IV 7.9-12.0; patella-tibia index 1.07-1.16.

Epigynum. Raised, median, white opaque extension forms along with lateral, membranous margins a bulging rectangle accompanied on each side by a thick protuberance (Fig. 8A); median elevation on epigynum bulges appreciably in profile (Fig. 8B). Spermathecae (Fig. 8C).

COMMENTS

Several species of general resemblance are found in the deserts of the Middle East and northern Africa. Considering, however, that no illustration of *O. sobrinus* was ever published and the female is described here for the first time, the records from Libya listed in catalogues need to be confirmed.

Adults of *O. sobrinus* are found from February to August. Males have occasionally been found in pitfall traps. Populations were found to comprise black and yellow members. Apparently the light coloured are more often encountered in the summer months of July-August.

Oxyopes sinaiticus n.sp.
(Fig. 9)

HOLOTYPE. — Adult ♀ from En Higiya (994/867), Sinai, Egypt, *leg.* A. Shulov, 24.IV.1968 (HUJ 15148).

ETYMOLOGY. — The specific name refers to the type locality.

DIAGNOSIS. — Based on female, *Oxyopes sinaiticus* belongs to the *O. lineatus* group of species but can be clearly distinguished by the shape of the epigynal and spermathecal structures.

DISTRIBUTION. — Egypt, known only from the type locality in Sinai.

DESCRIPTION

Male

Unknown.

Female

Measurements (of holotype): total length 5.9; carapace length 2.4, width 1.8, index 1.33: clypeus index 5.22; MOQ/cly ratio 1.7; PM index 1.8; leg lengths: I 8.1, II 7.7, III 5.4, IV 7.9; patella-tibia index 1.16.

Epigynum. Relatively very small. Nearly semicircular, raised median expansion, yellow at centre and transparent at upper edges; expansions extend on sides to epigastric furrow (Fig. 9A); median elevation rounded in profile (Fig. 9B); black spermathecal bodies slightly twisted (Fig. 9C).



FIG. 9. — *Oxyopes sinaiticus* n.sp. ♀, holotype; **A**, epigynum, ventral view; **B**, epigynum, lateral view; **C**, spermathecae, dorsal, inner view. Scale bar: 0.1 mm.

FIG. 10. — *Oxyopes globifer* ♂, left palpus; **A**, ventral view; **B**, dorsal view; **C**, retrolateral view of enlarged tibia and basal part of cymbium lacking a hump, detail; **D**, ventral view of cymbium with a hump, variation; **E**, retrolateral view of cymbium with a hump, variation. Scale bars: A, B, 0.25 mm; C-E, 0.1 mm.

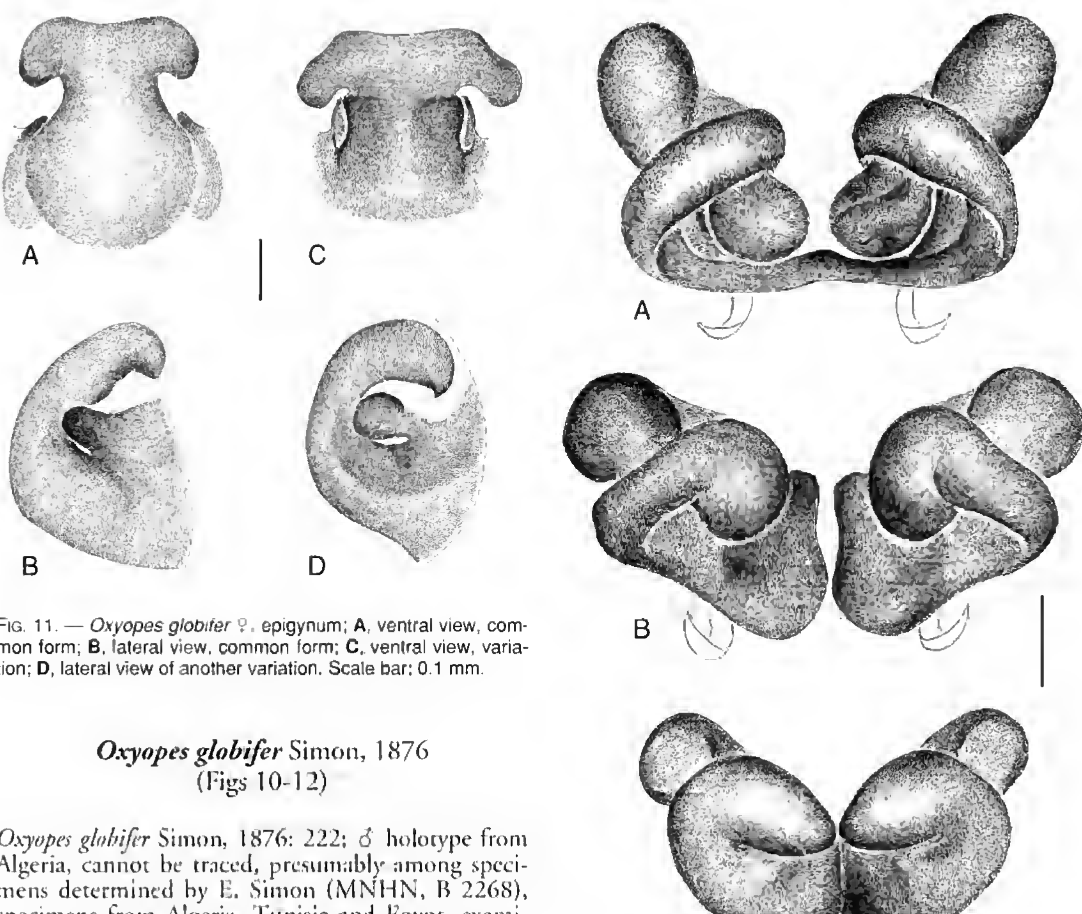


Fig. 11. — *Oxyopes globifer* ♀, epigynum; **A**, ventral view, common form; **B**, lateral view, common form; **C**, ventral view, variation; **D**, lateral view of another variation. Scale bar: 0.1 mm.

Fig. 12. — *Oxyopes globifer* ♀, spermathecae, dorsal, inner view; **A**, common form; **B**, variation; **C**, additional variation. Scale bar: 0.1 mm.

Oxyopes globifer Simon, 1876 (Figs 10-12)

Oxyopes globifer Simon, 1876: 222; ♂ holotype from Algeria, cannot be traced, presumably among specimens determined by E. Simon (MNHN, B 2268), specimens from Algeria, Tunisia and Egypt, examined). – Bonnet 1958: 3228. – Barrientos 1984: 155, fig. 4a-b, ♀ and ♂ from Cartagena, Spain.

Oxyopes attica Hadjissarantos, 1940: 42, fig. 12, ♂ from Attiki, Greece; type presumably lost. – Brignoli 1978b: 501, fig. 68, ♂ from Turkey; misidentification according to illustration; syn.n.

Oxyopes maracadensis Charitonov, 1946: 23, figs 24, 25, ♂ ♀ from Uzbekistan: type not available. – Andreeva & Tyshenko 1969: 224, fig. 7e, ♂ (Tadzhikistan). – Mikhailov & Fet 1986: 182, fig. 3a h (ZMUM, ♂ and ♀ from Turkmenia and Kazakhstan; examined); misidentification; syn.n.

Oxyopes eymiri Karol, 1967: 2, figs 1, 2, 3a ♀ from Eymir Lake, Ankara, Turkey; type cannot be traced; misidentification according to illustration; (not ♂ *O. eymiri* Brignoli 1978b: 501, fig. 67); syn.n.

Diagnosis. — *Oxyopes globifer* differs distinctly from all other *Oxyopes* species by the male palpus with the peculiar spoon-shaped expansion of the cymbium combined with the form of the sclerites and tibial apophyses, and by the strong laterally extending median structure of the epigynal plate of the female.

Distribution. — Algeria, Tunisia, Libya, Egypt (new record), Southern Spain, Greece, Turkey, Kazakhstan, Turkmenia, Uzbekistan, Tadzhikistan, Israel (new record).

Records. — Israel, Peza'el, Jerusalem, Ramat Rahel, Ashdod, En Gedi, Ofaqim, Nahal Sekher (135/053, loess), Be'er Mash'abbim, Shunera sands, Sede Boqer and surroundings, Nahal Hiyyon (154/956), Yotvata. Egypt, Sinai: Mitla Pass (979/939), Suez (February 1889; Simon det.; MNHN, B. 2268 n° 12133; examined).

DESCRIPTION

Male

Measurements (10 ♂♂): total length 3.7-5.2; carapace length 1.8-2.7, width 1.4-2.1, index 1.29-1.38; clypeus index 3.33-4.78; MOQ/cly ratio 1.67-2.14; PM index 1.4-2.0; leg lengths: I 6.7-11.3, II 6.1-10.4, III 5.0-8.0, IV 6.3-10.3; patella-tibia index 1.18-1.45.

Palpus. Relatively small. Cymbium basally with marked spoon-like expansion (Fig. 10A, B); shape of concave expansion varies slightly and it may bear a small, rounded brown hump on its surface (Fig. 10A, C-E); centre of bulbus taken by large, white distented mass, a transparent, mesal membrane and an elongated tegular outgrowth (Fig. 10A).

Female

Measurements (9 ♀♀): total length 4.7-9.0; carapace length 2.3-3.8, width 1.7-2.7, index 1.29-1.41; clypeus index 4.50-6.15; MOQ/cly ratio 1.43-1.82; PM index 1.4-2.3; leg lengths: I 7.6-12.6, II 7.2-11.8, III 5.8-9.8, IV 7.4-12.1; patella-tibia index 1.08-1.35.

Epigynum. Brown or yellow-opaque, large, broad and partly constricted median structure extends sidewards on upper edges with marked expansions (Fig. 11A, C); median structure bends strongly inwards (best viewed in profile, Fig. 11B, D). Black tubes of spermathecae usually curve on themselves; winding coils rather distinct (Fig. 12A) or outlines of compact bodies barely visible (Fig. 12B, C).

COMMENTS

Adult males were collected in Israel in January and from April to July, and adult females from April to September. Both sexes, occasionally, were found in pitfall traps. A female with an egg-

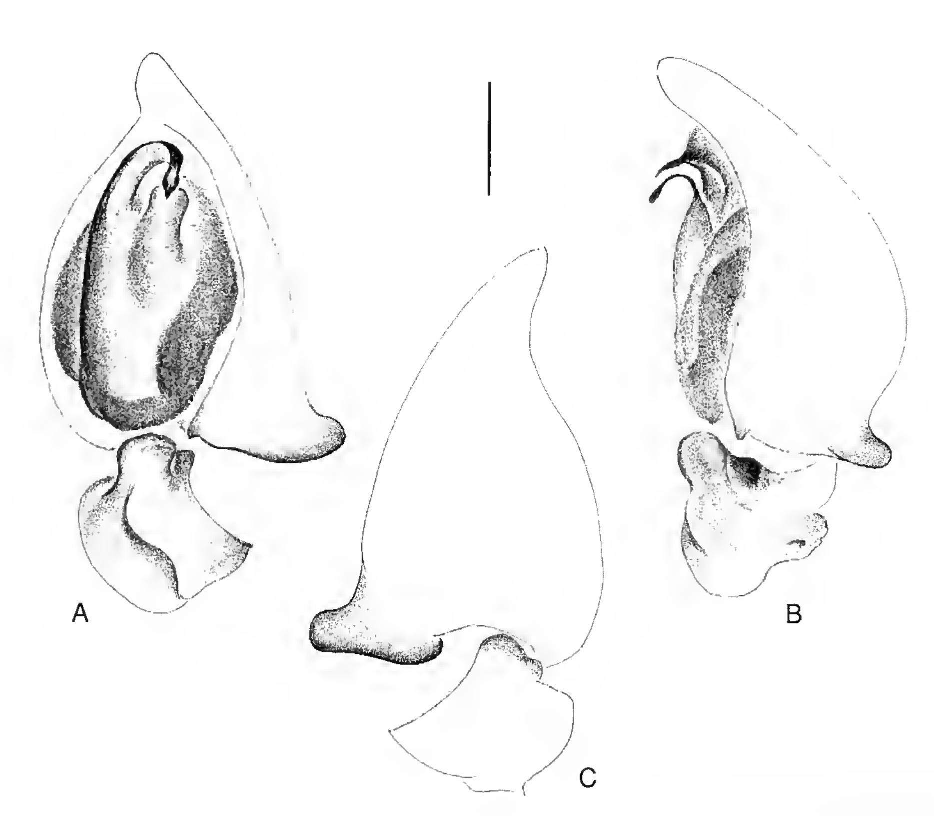


FIG. 13. — *Oxyopes dubourgi* ♂ from Sudan, holotype, left palpus; **A**, ventral view; **B**, retrolateral view; **C**, dorsal view. Scale bar: 0.25 mm.

sac attached to a twig was taken in May. Noteworthy is a superficial resemblance of the expanded cymbium of the male palpus in *O. globifer* with that of *O. dubourgi* Simon, 1904 from the Nile basin, Sudan (♂ holotype, Fig. 13A-C; MNHN, B. 2264). Also should be noted that in local populations a slight variation is encountered regarding the prominence or reduction in size of a little hump on the cymbial expansion of the male palpus. The course of the winding of the spermathecal tubes in the females varies slightly too, but there is no correlation between the sexes considering these variations and no different subspecies can be recognized here.

Oxyopes mediterraneus n.sp.
(Figs 14, 15)

Oxyopes pigmentatus Reimoser, 1913: 506; ♀ from Göl Baschi, possibly near Raqqa, North Syria (NMW; examined); misidentification.
Oxyopes candidus Hadjissarantos, 1940: 43, fig. 14a-b ♂; not *candidus* L. Koch (= *O. ramosus*).
Oxyopes sp. – Barrientos 1984: 155, fig. 3 ♂.

HOLOTYPE. — Adult ♂ from Hatira ridge, near Sede Boqer, Israel, 24.IV.1991 (HUJ 15149), ♀ paratype from the same locality, 21.V.1992 (HUJ 15150); pitfall traps, Y. Lubin.

ETYMOLOGY. — The specific name refers to the typical landscape of this species.

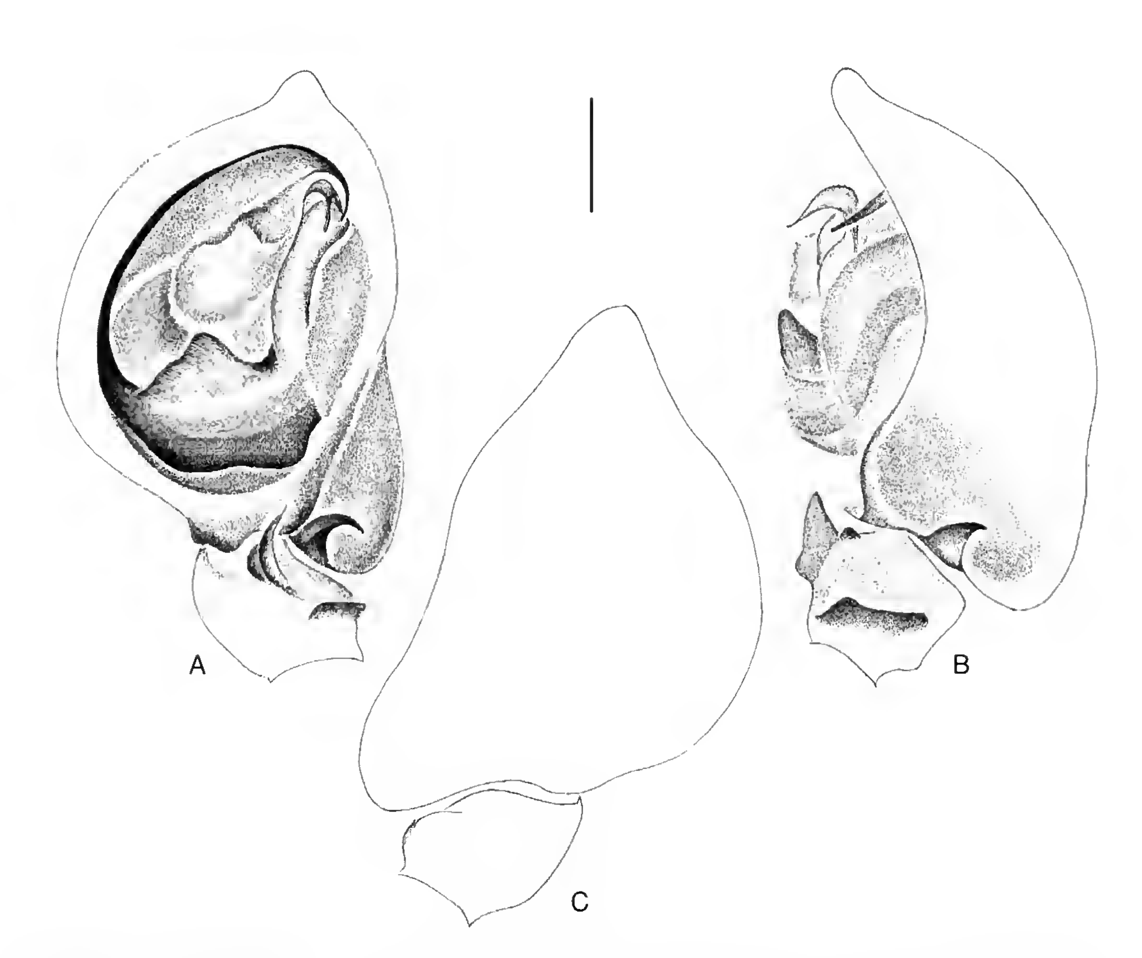
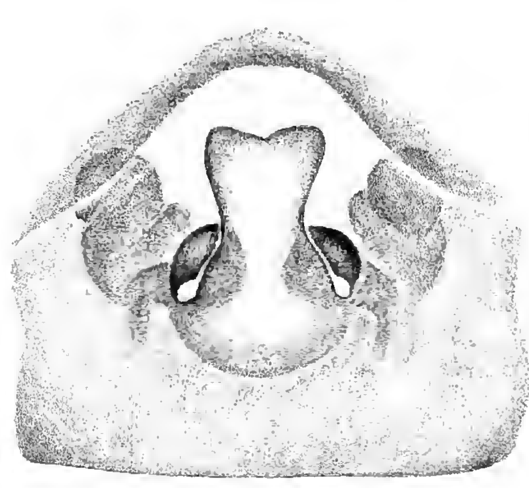


FIG. 14. — *Oxyopes mediterraneus* n.sp. ♂, holotype, left palpus; **A**, ventral view; **B**, retrolateral view; **C**, dorsal view. Scale bar: 0.25 mm.

DIAGNOSIS. — *Oxyopes mediterraneus* resembles *O. globifer* closely but differs distinctly by the configuration of the tegular sclerites and the shape of the black spine on the cymbium of the male palpus, and by the peculiar shape of the external protrusion on the epigynal plate of the female.

DISTRIBUTION. — Morocco, Spain (Barrientos 1984: 157), Greece (Hadjissarantos 1940), North Syria, Israel.

RECORDS. — Israel, Ofaqim, Arad, Nahal Sekher (132/058, sands), Be'er Mash'abbim, Yeroham, Sede Boqer and surroundings, Ma'ale Ramon, Ma'agurat (Bor) Loz (112/991).



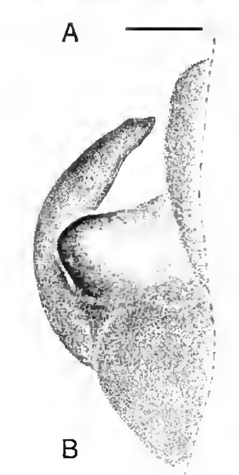


FIG. 15. — *Oxyopes mediterraneus* n.sp. ♀, paratype, epigynum; **A**, ventral view; **B**, lateral view. Scale bar: 0.1 mm.

DESCRIPTION

Male

Measurements (of holotype + 10 ♂♂; holotype listed first): total length 5.0, 4.9-5.8; carapace length 2.5, 2.4-3.2, width 1.9, 1.9-2.3, index 1.32, 1.24-1.39; clypeus index 4.18, 4.17-5.09; MOQ/cly ratio 1.74, 1.59-1.72; PM index 1.7, 1.5-1.9; leg lengths: I 9.4, 9.5-12.6, II 8.6, 8.7-11.3, III 6.6, 6.6-8.6, IV 8.5, 8.6-11.5; patella-tibia index 1.24, 1.26-1.37.

Palpus. Medium sized. Cymbium basally with concave, ectal extension armed with strong, pointed and inclined black process (Fig. 14A-C); tegulum bears long, fleshy, white outgrowth bordered basally by brown membranous lamella and medially by white distended mass (Fig. 14A).

Female

Measurements (10 ♀♀): total length 6.0-7.7; carapace length 2.8-3.4, width 2.0-2.5, index 1.29-1.40; clypeus index 4.67-5.83; MOQ/cly ratio 1.43-1.70; PM index 1.6-1.9; leg lengths: I 9.7-11.5, II 8.8-11.3, III 7.0-8.8, IV 9.2-11.5; patella-tibia index 1.09-1.21.

Epigynum. Small, tongue-like, narrow and sclerotic median protrusion notched at middle on upper edges (Fig. 15A); notch often turns into deep median split; median protrusion bends inwards slightly and occasionally breaks off (Fig. 15B). Coils of spermathecae as in *O. globifer* (Fig. 12A).

COMMENTS

Adult males were collected in Israel from March to July and females from April to August. *Oxyopes mediterraneus* is sympatric with *O. globifer* and both were found together in pitfall traps. *Oxyopes mediterraneus*, however, is much more abundant. Despite the similarity of the inner spermathecae in the females of both species, the two sexes of each species can be easily separated by their external genitalic features.

Oxyopes pigmentatus Simon, 1890
(Figs 16, 17)

Oxyopes pigmentatus Simon, 1890: 114; syntypes, ♂ + 4 ♀♀ from Sheikh Othman-Aden, Yemen (MNHN, B. 2276, n° 10771; examined). Not Sherriffs, 1955: 299, figs 12, 13 ♂♀, considering his illustrations.

DIAGNOSIS. — The male palpus with the four tibial apophyses combined with the form of the tegular outgrowth and the embolar trajectory, and the female epigynum with the unique transversal band and the peculiar inner spermathecae are diagnostic characters that distinguish *O. pigmentatus* easily from all other *Oxyopes* species.

DISTRIBUTION. — Yemen, Israel, new record.

RECORDS. — Israel, Kallia, Be'er Mash'abbim.

DESCRIPTION

Male

Measurements (2 ♂♂): total length 4.7-5.8; carapace length 2.5-2.8, width 1.8-2.1, index 1.33-1.39; clypeus index 3.30-3.63; MOQ/cly ratio 2.38-2.67; PM index 1.7-2.0; leg lengths: I 10.8-12.3, II 9.4-10.8, III 6.7-8.3, IV 9.2-10.2; patella-tibia index 1.40-1.43.

Palpus. Relatively small. Bulbus basally traversed by broad embolus tapering along mesal side and bending apically (Fig. 16A); fine whitish outgrowth rises at upper part of tegulum. Tibia bears apically two light, membranous protuberances and in the middle two blackish, pointed small apophyses (Fig. 16A-C).

Female

Note: no adult female was as yet collected in

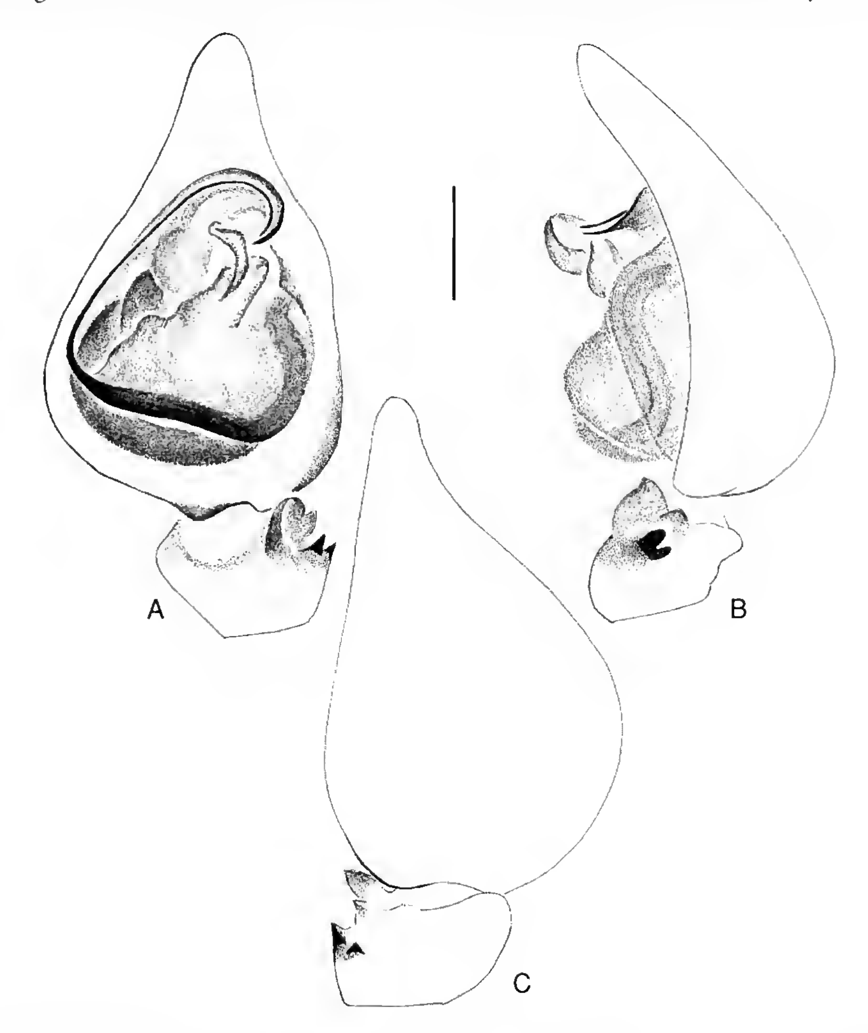


FIG. 16. — *Oxyopes pigmentatus* ♂, left palpus; **A**, ventral view; **B**, retrolateral view; **C**, dorsal view. Scale bar: 0.25 mm.

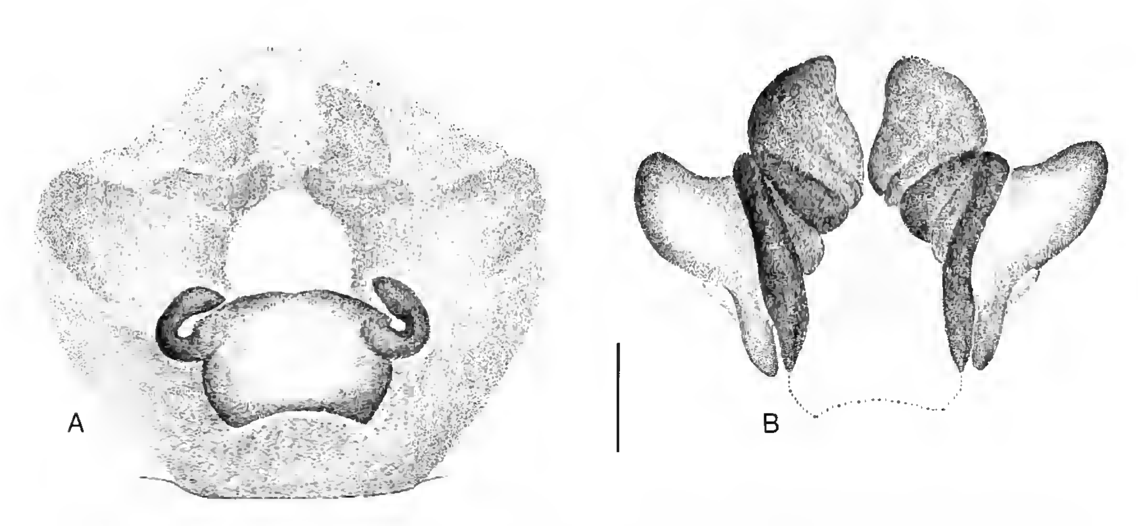


FIG. 17. — *Oxyopes pigmentatus* ♀ from Aden, syntype; **A**, epigynum, ventral view; **B**, spermathecae, dorsal, inner view. Scale bar: 0.1 mm.

Israel and drawings provided are of a syntype from Aden.

Epigynum. Elevated transversal, sclerotic and transparent brown band, borders light central depression (Fig. 17A); curved deep-red extensions rise on upper corners of transversal band. Relatively large spermatheca consists of a partly coiled red-brown median body and a light-brown lateral lobe (Fig. 17B).

COMMENTS

Simon (1890) reports finding *O. pigmentatus* in Yemen on Sea-blile (*Sueda*) shrubs, a plant with species growing also in Israel. The two adult males collected thus far in Israel were found in July in the hottest sites of this country: along the Dead Sea and in the sand dunes of the Negev. Reimoser's (1913) record of *pigmentatus* from Mesopotamia proved to be *O. mediterraneus* n.sp. (see above). Comparing the syntypes of *O. pigmentatus* with the incompatible illustrations in Sherriffs (1955) there apparently has been some misplacement. Also his presentation of an adult female of *O. rutilius* Simon, 1890 from Aden (Sherriffs 1955: 302, fig. 19) is questionable considering that Simon (1890: 114) described only very young, unidentifiable specimens (MNHN, B. 2276, n° 10772; 5 immature syntypes, examined).

Oxyopes badhyzicus Mikhailov *et* Fet, 1986
(Figs 18, 19)

Oxyopes badhyzicus Mikhailov *et* Fet, 1986: 183, figs 3b-d, ♂ ♀; ♂ holotype and ♀ ♀ paratypes from Badhyz Desert, Turkmenia (ZMUM, Ta-3567, Ta-3568; examined).

DIAGNOSIS. — *Oxyopes badhyzicus* differs distinctly from all other *Oxyopes* species by the male palpus with the peculiar expansions of the tegular outgrowth, the form of the embolar tip and the shape of the tibial apophyses, and by the extraordinary form of the epigynal plate of the female.

DISTRIBUTION. — Turkmenia, Israel, new record.

RECORDS. — Israel, Palmahim, Ben Zakkay, Lahav, Ofaqim, Nahal Sekher, Revivim, Be'er Mash'abbim, Sede Boqer and surroundings.

DESCRIPTION

Male

Measurements (10 ♂ ♂): total length 4.3-6.2; carapace length 2.0-2.7, width 1.5-2.2, index 1.25-1.33; clypeus index 3.27-4.54; MOQ/cly ratio 1.50-1.92; PM index 1.5-1.8; leg lengths: I 8.6-12.0, II 7.9-11.2, III 4.9-6.5, IV 8.5-11.8; patella-tibia index 1.32-1.46.

Palpus. Thick, black terminal portion of embolus curves on itself apically (Fig. 18A, B); whitish outgrowth of tegulum expands into extensions

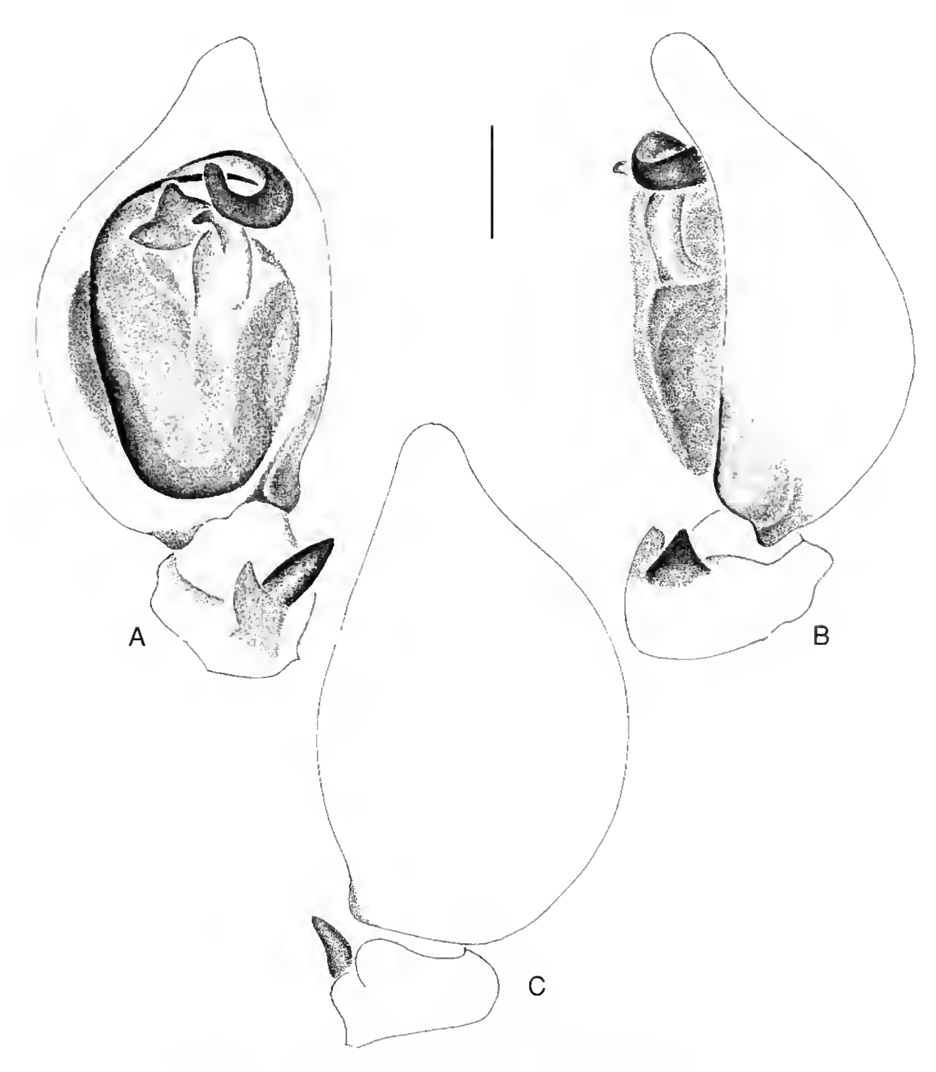


Fig. 18. — *Oxyopes badhyzicus* ♂, left palpus; **A**, ventral view; **B**, retrolateral view; **C**, dorsal view. Scale bar: 0.25 mm.

resting below embolar tip (Fig. 18A, B). Tibia armed with a black coned apophysis and a light membranous one rising from a common base (Fig. 18A-C).

Female

Measurements (6 ♀♀): total length 7.2-8.6; carapace length 2.6-3.2, width 2.0-2.5, index 1.20-1.39; clypeus index 4.62-5.0; MOQ/cly ratio 1.41-1.57; PM index 1.7-2.2; leg lengths: I 9.3-10.9, II 8.9-10.6, III 5.7-7.0, IV 9.7-11.9; patella-tibia index 1.11-1.20.

Epigynum. Relatively large. Central depression divided by a distinct median septum into two cavities bordered on upper sides by thick black rims (Fig. 19A). Spermathecae form large brownish bodies with thick, inwards bent, black extensions (Fig. 19B).

Comments

Only a few females have been collected whereas males with their rather delicate body have often been taken by pitfall traps. Adult males are found from April to September and females from May to December.

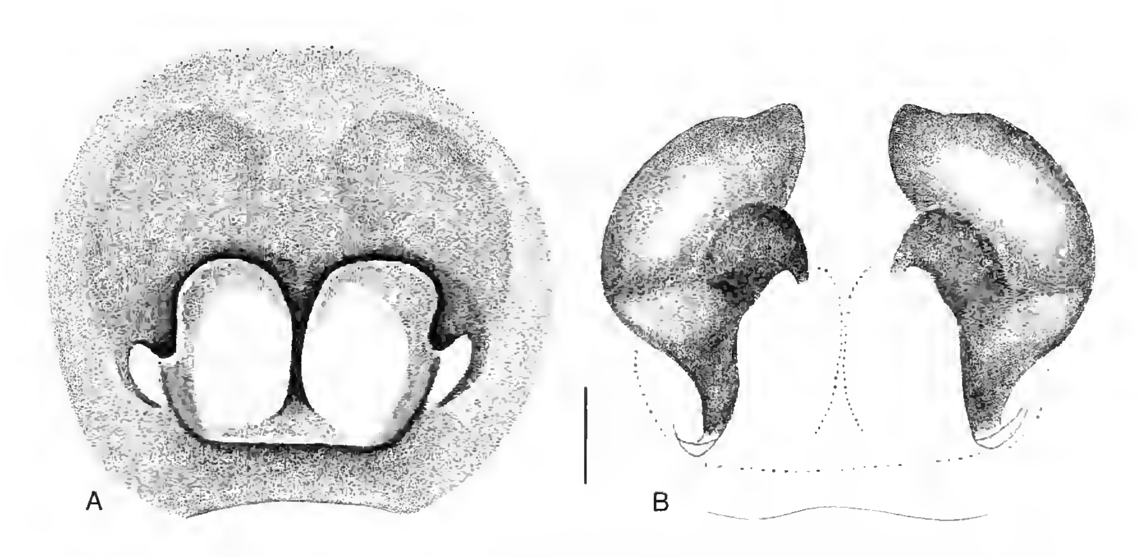


FIG. 19. — *Oxyopes badhyzicus* ♀; **A**, epigynum, ventral view; **B**, spermathecae, dorsal, inner view. Scale bar: 0.1 mm.

Genus *Peucetia* Thorell, 1869

TYPE SPECIES. — *Pasithea viridis* Blackwall, 1858; preoccupied name of genus replaced by Thorell 1869: 37 (see Bonnet 1958: 3438).

DESCRIPTION

Bright green or yellowish spiders often tinged with red and white streaks. Medium to large sized, 8 to over 20 mm in body length. Carapace longer than wide, narrow in front, with distinct fovea (Fig. 20A); clypeus often with dark markings running down also along chelicerae. Anterior row of eyes strongly recurved with anterior-laterals largest of all eyes and anterior-medians clearly the smallest (Fig. 20B, C). Posterior row of eyes slightly procurved with eyes about the same size and subequally placed. Distance between anterior-lateral eyes 1.4-1.6 times longer than space between posterior-median eyes (view trapeze outlined, Fig. 20B). Labium elongated and greatly exceeded in length by the very long palpal endites (Fig. 20D). Chelicerae have a very long basal segment, short fang and no teeth. Legs relatively long; legs formula: I, II, IV, III. Opisthosoma elongated, often uniformly coloured or with pattern of chevrons, sometimes with a continuous mid-dorsal mark. The green colour fades completely on preservation in alcohol. Male palpus bears a long, sidewards projecting, slightly concave, median apophysis and a peculiar retrolateral paracymbial sclerite (Figs 22A, B, 24A, B); segments of male palpus often long and slender with tibia sometimes appreciably longer than tarsal (bulbar) portion (Fig. 21). Female epigynum usually consists of central depression bordered by variously shaped projections or plate bearing diverse humps and prominences (Figs 23A, 25A, 27A).

REMARKS

Peucetia comprises plant-dwelling spiders often found on shrub-like glandular plants e.g. *Onois* or *Cleome* in Israel as well as in southern Spain or Yemen (Simon 1890: 113; Barrientos 1991: 91). They are agile spiders with quick, darting movements. Knowledge on the biology of *Peucetia* is based primarily on studies of the North American *P. viridans* (Hentz, 1845) corroborated by rather fragmentary observations on some congeners from other parts of the world (for references, see Van Niekerk & Dippenaar-Schoeman 1994).

Peucetia spiders build no snares but make use of silk by trailing a dragline when dropping on prey or while hanging inverted from silk threads awaiting to sweep in with their legs, moths or wasps

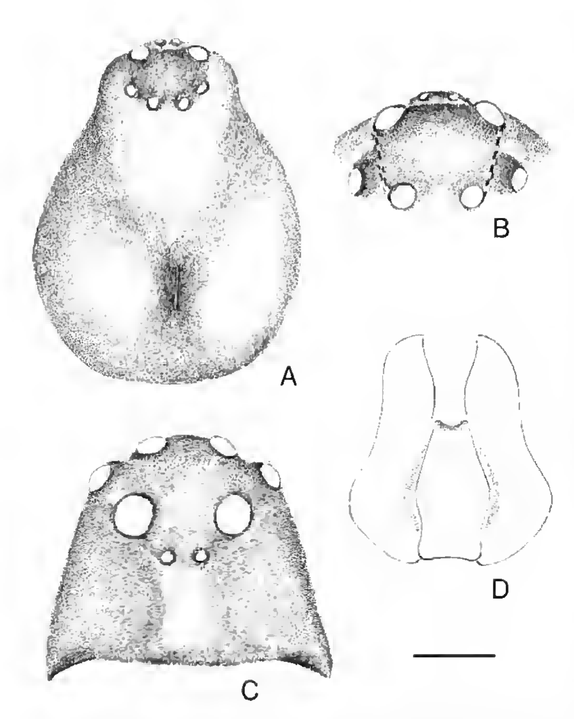
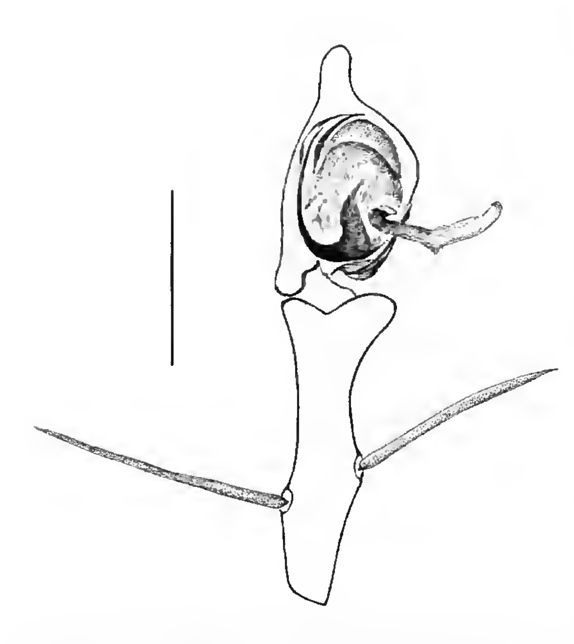


FIG. 20. — *Peucetia*: **A**, carapace, dorsal view; **B**, eye arrangement, dorsal view, detail; characteristic trapeze outlined; **C**, eye arrangement, frontal view; **D**, labium and palpal endites. Scale bar: A, 1 mm; B-D, 0.5 mm.


FIG. 21. — *Peucetia* ♂, tibia and bulbus of left palpus; view of common proportions and tibial bristles. Scale bar: 1 mm.

flying under them (Rovner 1980). Their mating behaviour also involves silk as both male and female are suspended on threads, inverted with their venters facing each other (Whitcomb & Eason 1965). The egg-sac is suspended by silk lines attached to nearby twigs and guarded continuously, presumably mainly from ants, by the female hanging upside down from it. The spider may relocate the egg-sac to a new place in response to disturbances, by sequentially attaching and detaching lines, but it never actually carries the sac (Fink 1987). Spitting of a liquid from the spread chelicerae by the female of *P. viridans* when disturbed has been described, but it apparently is never used against conspecifics or ants (Fink 1984). The female remains with the egg-sac until after the spiderlings have emerged. These stay close to the egg-sac for a few days and then disperse. The young construct a small, irregular foothold-web on which they rest or hang in inverted position (Kaston 1972). *Peucetia viridans* is reported to prey primarily on flying insects: bees and wasps, flies and moths of different families (Whitcomb *et al.* 1963; Randall 1982). Feeding on lepidopteran larvae, although common in *Peucetia*'s habitat, was not observed (Turner 1979: 151). *Peucetia* may sweep in prey both day and night (Rovner 1980).

Nearly sixty species of *Peucetia* are known at present from throughout the world, mainly from the tropics of America, Africa and to a lesser extent from warmer parts of the Oriental and Palearctic regions. Only two species are known from North America and one from southern Europe, whereas three species are reported here from Israel. Two of the latter have never before been recorded from Israel.

Peucetia virescens (O. P.-Cambridge, 1872) (Figs 22, 23)

Pasithea virescens O. P.-Cambridge, 1872: 314; syntypes, 2 immature specimens from Jerusalem, Israel (HECO, B.820, t.3; examined; attributable to the sole species occurring in Jerusalem).

Peucetia virescens – Simon 1876: 222; 1882: 217, adult ♀ from "Syria"; 1884: 183, adult ♂ and ♀ from close to Beirut, Lebanon (MNHN; not examined). – Van Niekerk & Dippenaar-Schoeman 1994: 46, fig. 15 ♀.

Diagnosis. — The combination of the low tegular ridge, smooth cymbial notch and the shape of the paracymbium of the male palpus, and the peculiar form of the epigynal protuberances and the spermathecae of the female are all diagnostic characters that distinctly separate *P. virescens* from all other *Peucetia* species.

Distribution. — Israel, Lebanon, Jordan (Gerash; Pavesi 1895: 8), Egypt (Dakhla Oasis; Van Niekerk & Dippenaar-Schoeman 1994: 48), Libya (Fezzan; Caporiacco 1936b: 7).

Records. — Israel, Newe Ya'aqov, Jerusalem, Ma'ale Adummim.

Description

Male

Measurements (3 ♂♂): total length 7.8-8.0; carapace length 3.7-4.1, width 3.0-3.1, index 1.23-1.32; clypeus index 3.8-4.4; MOQ/cly ratio 1.96-2.0; PM index 1.05-1.29; leg lengths: I 19.2-22.9, II 16.8-19.4, III 13.4-15.7, IV 15.0-17.4; patella-tibia index 1.62-1.71.

Palpus. Elongated tibia, longer than bulbus, armed with two long bristles. Bulbus apically with low tegular ridge (TR; Fig. 22A); long median apophysis (M) with small process protruding from lower side of shaft (Fig. 22A, B); basal retrolateral notch (N) on cymbium with smooth edges, exposing blackish, relatively small paracymbium (P; Fig. 22B).

Female

Measurements (8 ♀♀): total length 11.1-12.9; carapace length 4.2-5.0, width 3.1-3.7, index 1.32-1.39; clypeus index 5.07-6.0; MOQ/cly ratio 1.27-1.47; PM index 0.75-1.0; leg lengths: I 16.2-20.2, II 14.3-18.1, III 12.1-15.6, IV 13.5-17.4; patella-tibia index 1.18-1.43.

Epigynum. Globular swellings separated by deep median furrow tapering anteriorly into widened depression (Fig. 23A); swellings with dark, partly truncated edges extend over openings on ectal sides (Fig. 23A); openings, narrow, slit-like on posterior view (Fig. 23B). Spermathecae (Fig. 23C).

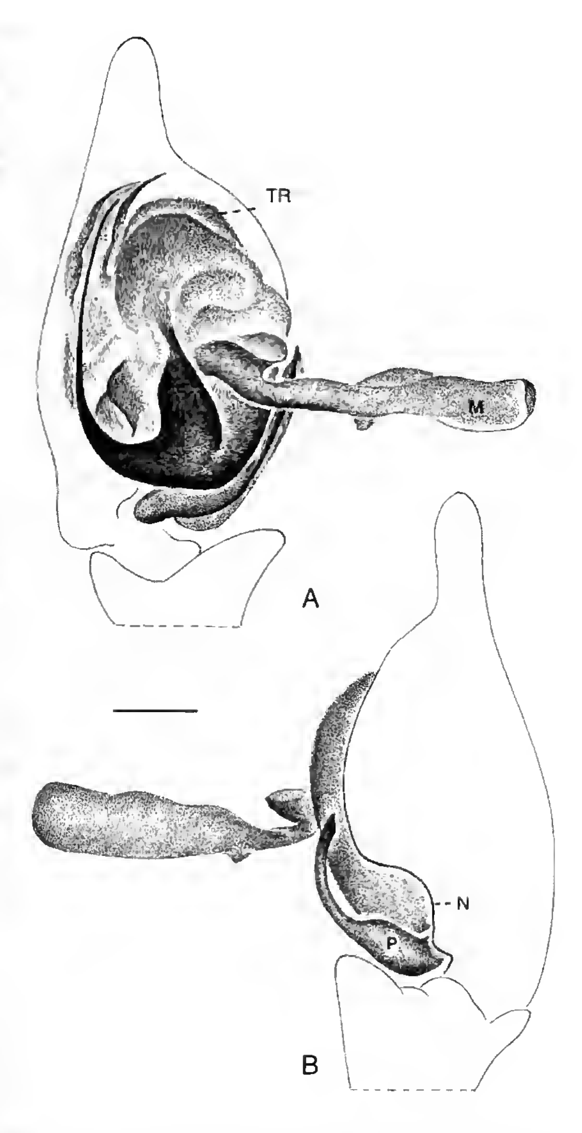


Fig. 22. — *Peucetia virescens* ♂, left palpus; **A**, ventral view; **B**, retrolateral view. Abbreviations: **M**, median apophysis; **N**, cymbial notch; **P**, paracymbium; **TR**; tegular ridge. Scale bar: 0.25 mm.

Comments

The male is illustrated here for the first time. Remnants of broken shafts of the paracymbial sclerite of the male palpus are often found stuck inside the openings on the female epigynum. Adult males were collected in May and July and adult females from March to July. A female with an egg-sac was taken in June. The occurrence of *P. virescens* in relatively mesic habitats, e.g. Beirut in Lebanon and north of Jerusalem as well as in xeric sites like Ma'ale Adummim is unparalleled

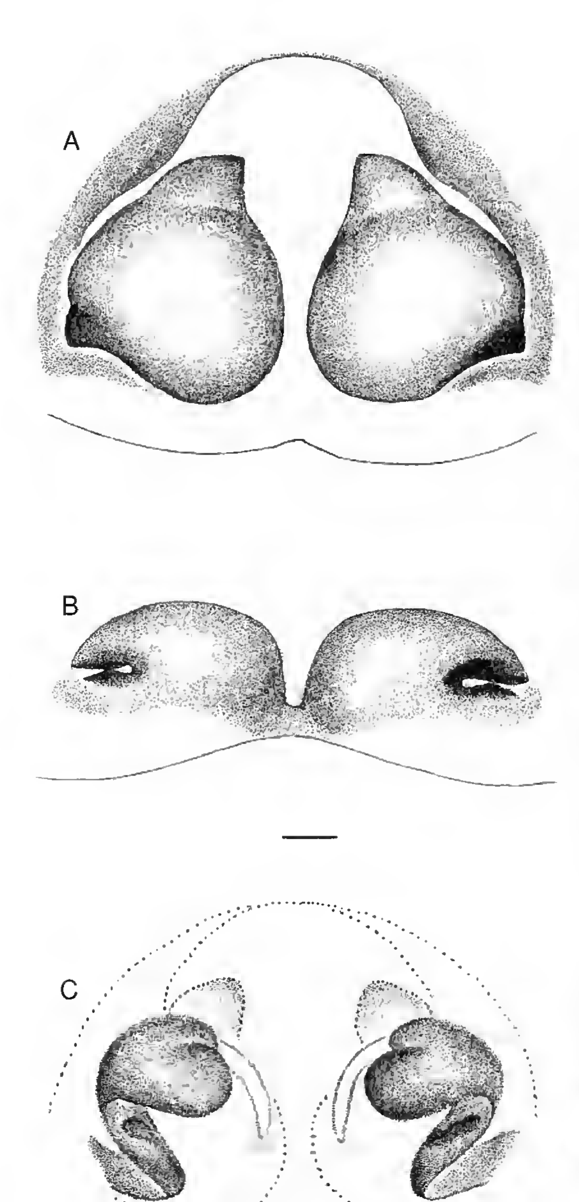


FIG. 23. — *Peucetia virescens* ♀; **A**, epigynum, ventral view; **B**, epigynum, posterior view; **C**, spermathecae, dorsal, inner view. Scale bar: 0.1 mm.

by other *Peucetia* of this region which are found only in semi-eremic or arid habitats. The listing of Arabia by Reimoser (1919: 159), copied repeatedly thereafter, is unfounded and should be newly corroborated.

Peucetia arabica Simon, 1882
(Figs 20, 21, 24, 25)

Peucetia arabica Simon, 1882: 216; ♂♂ and ♀♀ syntypes from Aden (MNHN, B, 2250, n° 4203; examined). – Roewer 1954a: 334. – Bonnet 1958: 3488. – Van Niekerk & Dippenaar-Schoeman 1994: 45, fig. 15g-k.

DIAGNOSIS. — *Peucetia arabica* resembles *P. virescens* very closely and can be distinguished by the high tegular ridge of the male palpus and fine details of the paracymbium, and by the peculiar shape of the swellings on the epigynum of the female with their lateral extensions.

DISTRIBUTION. — Aden (Simon 1882), Yemen (Hodeida, Gebel Milhan; Simon 1890: 113; Hadhramaut; Pocock 1895), Perim Island (Simon 1890: 123), Ethiopia (Pavesi 1897; Simon 1904), Sudan (Omdurman; Simon 1907; Khartoum; Van Niekerk & Dippenaar-Schoeman 1994), Libya (El-Auenat; Caporiacco 1936a: 118; Van Niekerk & Dippenaar-Schoeman 1994), Morocco (Jocqué 1977: 335), Egypt (Gebel Ataka; Simon 1890; Cairo; Simon 1907; Siwa Oasis; Denis 1947; Sinai – new record), Israel – new record, presumably Jordan and Saudi Arabia.

RECORDS. — Israel, Ma'ale Shalem, En Gedi, Miz'pe Groffit, Elat. Egypt-Sinai: St Catherine's Monastery and surroundings (049/775), Wadi Isla (040/742), Wadi Beda (080/730), Sharm e-Shikh (080/696).

DESCRIPTION

Male

Measurements (5 ♂♂): total length 6.7-8.8; carapace length 3.2-4.2, width 2.6-3.3, index 1.23-1.31; clypeus index 3.4-4.5; MOQ/cly ratio 1.92-2.35; PM index 0.72-1.0; leg lengths: I 18.4-22.2, II 15.6-18.9, III 12.8-15.8, IV 15.0-17.9; patella-tibia index 1.57-1.68.

Palpus. Tibia longer than bulbus bears two long, thick bristles. Bulbus apically with high, raised tegular ridge (Fig. 24A); median apophysis with rather distinct process protruding from lower side of shaft (Fig. 24A, B); basal retrolateral notch of cymbium often with lobe-like, brown expansion (Fig. 24B); paracymbium relatively large.

Female

Measurements (10 ♀♀): total length 9.5-13.0; carapace length 4.8-6.0, width 3.4-4.3, index

1.29-1.44; clypeus index 5.36-7.34; MOQ/cly ratio 1.05-1.20; PM index 0.66-1.0; leg lengths: I 17.6-21.6, II 15.4-20.0, III 13.5-17.6, IV 15.3-19.6; patella-tibia index 1.25-1.34.

Epigynum. Large bulbous swellings distinctly separated medially and declining gradually anteriorly below edges of relatively narrow depression (Fig. 25A); posterior part of each swelling expanding ectally into spur-like, blackish extension (Fig. 25A); openings above lateral extensions bordered by brown, transparent edges guarding orifices; lateral extensions of swellings clearly visible on posterior view (Fig. 25B). Spermathecae (Fig. 25C).

COMMENTS

Adults of both sexes have been taken at various months of the year. *Peucetia arabica* is the more

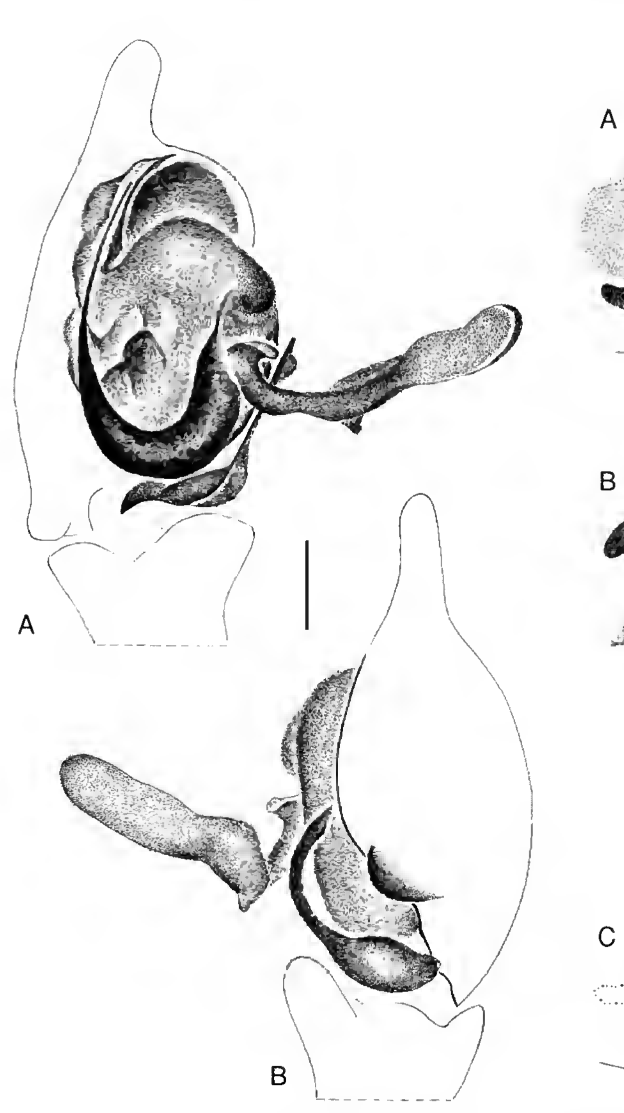


FIG. 24. — *Peucetia arabica* ♂, left palpus; **A**, ventral view; **B**, retrolateral view. Scale bar: 0.25 mm.

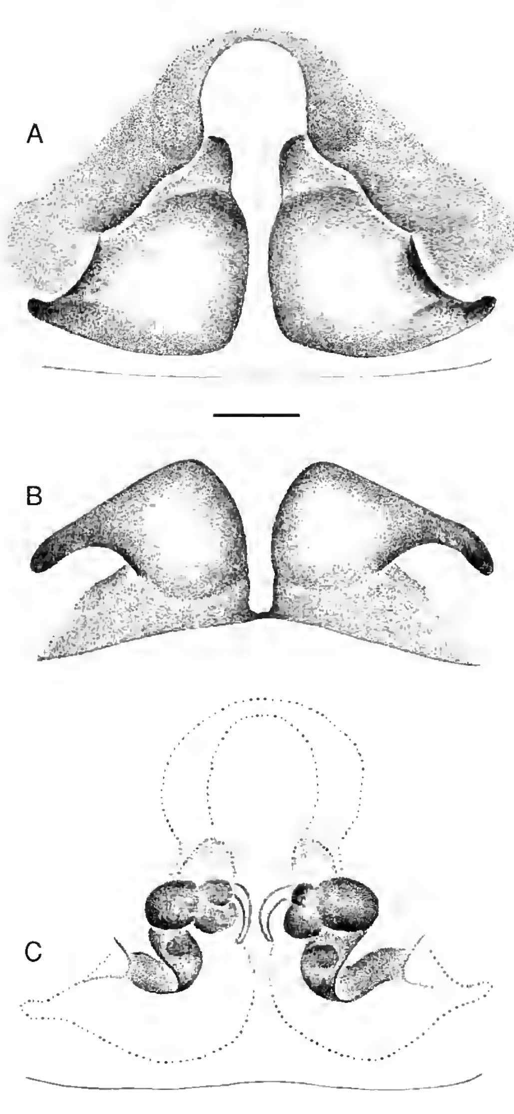


FIG. 25. — *Peucetia arabica* ♀; **A**, epigynum, ventral view; **B**, epigynum, posterior view; **C**, spermathecae, dorsal, inner view. Scale bar: 0.2 mm.

common *Peucetia* of southern Israel. Green or occasionally yellowish specimens are encountered on various species of the sticky *Cleome* plants, as formerly indicated for Yemen by Simon (1890: 113; 1898a: 375).

Peucetia viridis (Blackwall, 1858)
(Figs 26, 27)

Pasithea viridis Blackwall, 1858: 428; ♂ holotype from Algiers, Algeria in HECO examined by Van Niekerk & Dippenaar-Schoeman 1994: 27.
Peucetia viridis – Thorell 1869: 37. – Roewer 1954a: 335. – Bonnet 1958: 3493. – Denis 1966: 128, fig. 46. – Barrientos 1991: 83, figs 2, 3. – Van Niekerk & Dippenaar-Schoeman 1994: 27, fig. 9a-k.

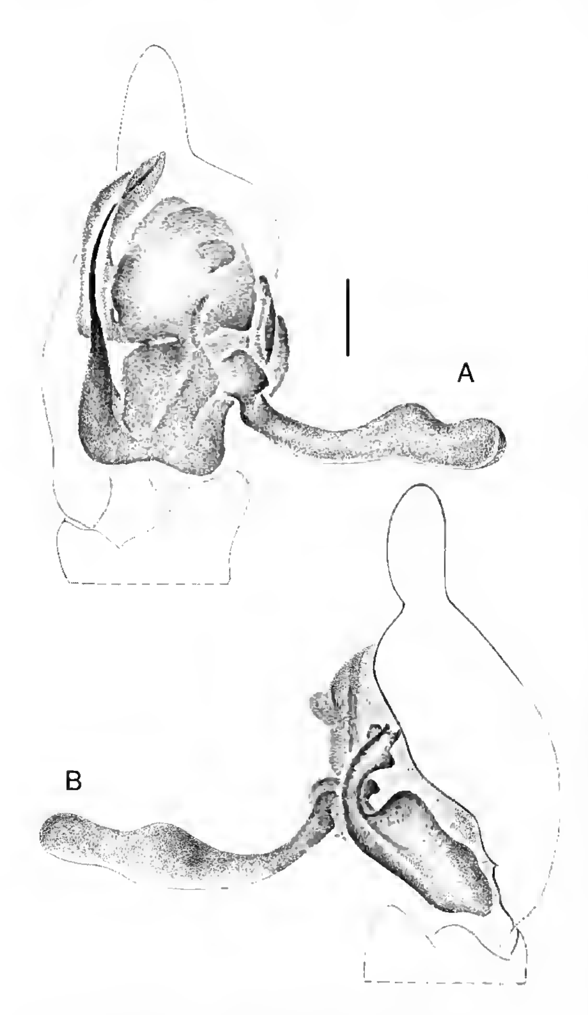


Fig. 26. — *Peucetia viridis* ♂ from Spain, left palpus; **A**, ventral view; **B**, retrolateral view. Scale bar: 0.25 mm.

Diagnosis. — *Peucetia viridis* differs distinctly from all other *Peucetia* species by the peculiar shape of the paracymbial sclerite of the male palpus, and by the form of the genital structures of the female epigynum.

Distribution. — Spain (along Mediterranean coast, Simon 1898a: 76; Barrientos 1991), Cape Verde Islands (Simon 1897), Algeria (Blackwall 1858), Libya (Denis 1966), Namibia, Botswana, South Africa (Van Niekerk & Dippenaar-Schoeman 1994), Ethiopia (Pavesi 1883), Egypt (Sinai: Gebel Mussa, O. P.-Cambridge 1870: 819), Rhodes (Kattavia, Caporiacco 1929: 237), Israel - new record; presumably Jordan.

Records. — Israel, near Jericho.

Description
Male
Note: no adult male has been collected thus far in Israel, and drawings provided are of a specimen from Cartagena, Spain, determined by E. Simon.
Palpus. Tibia longer than bulbus and armed with two long bristles. Bulbus apically with low tegular ridge; median apophysis without process on underside of shaft (Fig. 26A); paracymbium relatively large with small protuberances projecting along its apical portion (Fig. 26B).

Female
Measurements (2 ♀♀): total length 13.3-14.5; carapace length 5.3-6.3, width 3.7-4.4, index 1.43; clypeus index 7.5-7.8; MOQ/cly ratio 0.92-1.0; PM index 0.76-0.87; leg lengths: I 24.2-28.2, II 20.7-24.9, III 17.1-20.3, IV 20.3-24.4; patella-tibia index 1.52-1.53.
Epigynum. Relatively flattened with short finger-like lobes bulging into large anterior depression (Fig. 27A); brown posterior edges of lobes slightly raised above ectal openings, and lobes medially only little depressed (Fig. 27A, B). Spermathecae (Fig. 27C).

Comments
Only two adult females were as yet found in Israel, in the rather hot area of Jericho. One was taken in May with an egg-sac, the other in June. These proved identical with numerous specimens

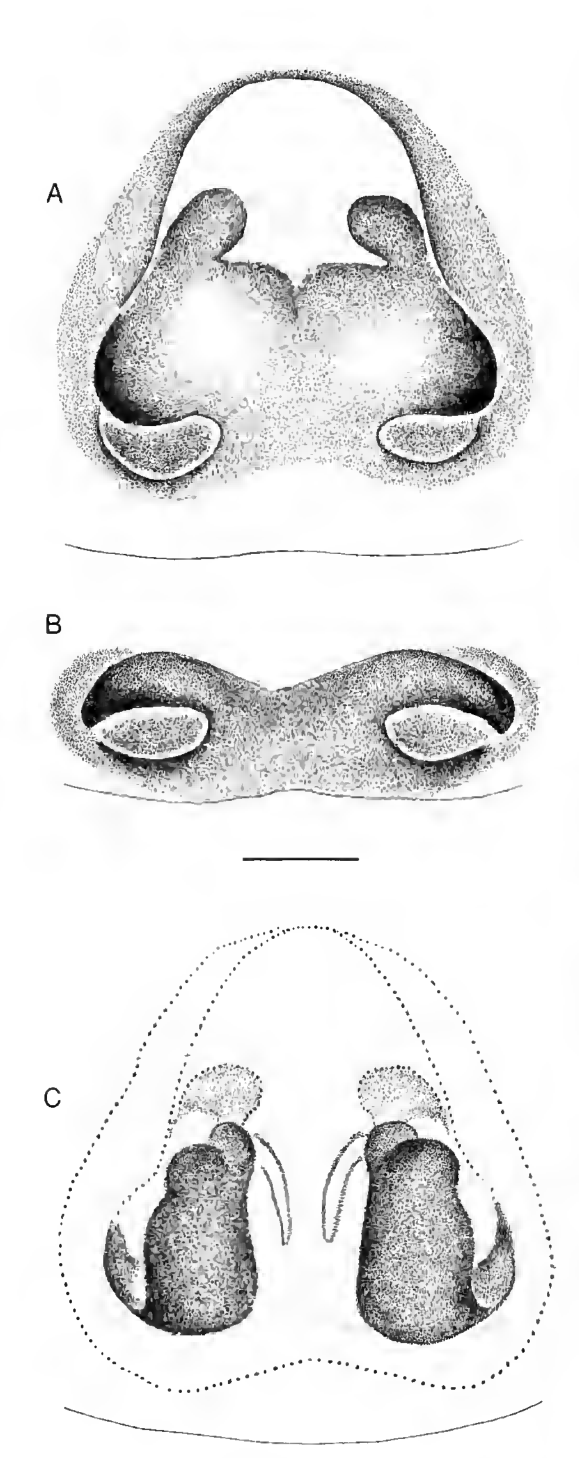


FIG. 27. — *Peucetia viridis* ♀; **A**, epigynum, ventral view; **B**, epigynum, posterior view; **C**, spermathecae, dorsal, inner view. Scale bar: 0.2 mm.

examined from Spain (Cartagena; MNHN, B. 2255, n° 708). The occurrence in Israel of a species distributed in South Africa is rather exceptional. Apparently *P. viridis* is first and foremost an African species with a northward influx into Spain on one side of the Mediterranean and along Sinai into Israel on the other side. The sole Aegean record from Rhodes, seemingly should be newly authenticated.

Family PISAURIDAE Simon, 1898

The nursery-web spiders of Israel are hunters without snares that chase their prey or wait for it clutching at leaves. They are found in wet habitats of grasses and low vegetation, resembling in general the much more abundant wolf-spiders (Lycosidae). The nursery-web, a bell-like web enclosing an egg-sac or new hatchlings, is considered the most characteristic feature of this family. Their eyes are arranged in two rows with the anterior row visible from above and the posterior row strongly recurved in dorsal view. The large chelicerae bear strong teeth on both margins. Their legs are long with trochanters deeply notched and tarsi are armed with three dentated claws. Opisthosoma tapers to a pointed end and bears three pairs of spinnerets but no colulus. Male palpus is armed with a tibial apophysis (absent in lycosids) and the female epigynum is often divided by a median septum. Three pisaurid species are present in Israel, numbering thus as many as in all of western Europe. These belong to two genera: *Pisaura* and *Rothus*. The latter genus is recorded here for the first time from Asia.

Genus *Pisaura* Simon, 1885

TYPE SPECIES. — *Araneus mirabilis* Clerck, 1757, designated by Simon (1885: 354).

DESCRIPTION

Medium to relatively large spiders, females may reach over 14 mm in body length. Carapace brown to blackish coloured often with a dorsal longitudinal stripe. Body densely covered with setae. Carapace longer than wide with triangular, vertical, rather high clypeus (Fig. 28A, B).

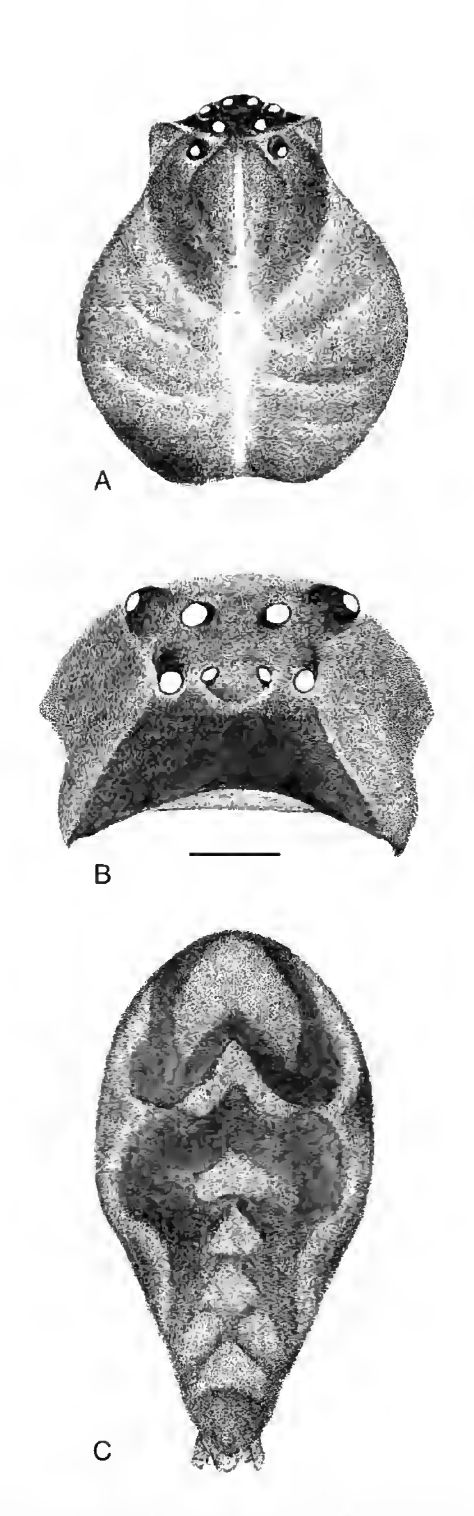


Fig. 28. — *Pisaura*; **A**, carapace, dorsal view; **B**, eye arrangement, frontal view; **C**, opisthosoma, dorsal view. Scale bar: A, C, 1 mm; B, 0.5 mm.

Anterior row of eyes nearly straight or slightly recurved; anterior-median eyes equal or often slightly smaller than anterior-lateral eyes. Posterior eyes larger than anteriors, with the posterior-medians largest of all. Median-ocular-quadrangle posteriorly wider than anteriorly and about 1-1.5 times longer than clypeus height. Labium rebordered, about as long as wide and clearly exceeded in length by endites of palpi. Chelicerae usually with three teeth on each margin. Legs spinose, formula usually: IV, II, I, III. Opisthosoma elongated, dark coloured, with or without a light longitudinal band or with a dorsal pattern (Fig. 28C); the pattern is even intraspecific rather variable. Male palpus with fine, sclerotic retrolateral embolus ensheathed by a conspicuous conductor, a hooked median-apophysis and a prominent distal-apophysis (da of Sierwald 1990; Figs 29A, C, 31A, B). Female epigynum anchor-shaped (Figs 30A-E, 32A).

Remarks

Pisaura comprises about a dozen species distributed in the Palearctic and Oriental Regions. These include, regardless of the highly variable epigyna found in exactly the same population, some doubtful species based solely on females allegedly distinguishable from *P. mirabilis* (their males are all alike). There are two sympatric species in Israel and each of the sexes can be easily distinguished.

Pisaura mirabilis (Clerck, 1757) (Figs 29, 30)

Araneus mirabilis Clerck, 1757: 108, pl. 5, fig. 10; ♂ and ♀ syntypes from Sweden, presumably lost.
Pisaura mirabilis – Simon 1885: 354. – Palmgren 1943: 7, fig. 2 (as *listeri*). – Roewer 1954a: 119. – Bonnet 1958: 3674. – Azheganova 1968: 22, figs 25, 26. – Loksa 1969: 130, figs 87, 88. – Miller 1971: 170, figs 13, 14. – Blandin 1976: 926, figs 1, 7a, 10, 13, 15, 18. – Brignoli 1977: 63, figs 37-40; 1978a: 204, figs 1, 2. – Platnick 1989: 395; 1993: 521.

Diagnosis. — The shape of the tibial retrolateral apophysis of the male palpus and the form of the conductor and the distal-apophysis are distinctive characters of *P. mirabilis* clearly separating it from all other *Pisaura* species. The females with their great epigynal variation, may however, not always be distinguishable unless accompanied by a male.

DISTRIBUTION. — Palearctic.

RECORDS. — Israel, northern and central parts throughout.

DESCRIPTION

Male

Measurements (6 ♂♂): total length 8.7-11.0; carapace length 3.9-4.5, width 3.0-3.5, index 1.21-1.30; clypeus index 3.0-3.25; MOQ/cly ratio 1.11-1.25; leg lengths: I 17.4-20.1, II 18.0-20.7, III 13.7-15.9, IV 18.5-21.2; patella-tibia index 1.55-1.69.

Palpus. Tibia with relatively slender, brown retrolateral apophysis tapering to an undulating, pointed tip (Fig. 29A-C); conductor (C) with fine barbed inner margins encircles apically about half of bulb; large distal-apophysis (da) extends over nearly entire centre of bulb and ends with a hook (Fig. 29A, C).

Female

Measurements (10 ♀♀): total length 10.4-14.5; carapace length 3.9-5.0, width 3.1-4.0, index 1.17-1.35; clypeus index 2.29-3.22; MOQ/cly ratio 1.10-1.51; leg lengths: I 16.0-21.5, II 16.4-22.0, III 13.1-17.8, IV 17.7-23.8; patella-tibia index 1.46-1.63.

Epigynum. Rather variable (Fig. 30A-E). Slender or broad gutter-like median septum widens anteriorly or anterior walls close on entrance with blackish cap-like thickenings (Fig. 30A-E); anterior and lateral distentions of swollen cross-arm of anchor-like septum vary greatly. Spermathecae and inner folds show negligible variation in form except for little differences in sclerotization (Fig. 30F).

COMMENTS

Pisaura mirabilis is well-known. Its peculiar

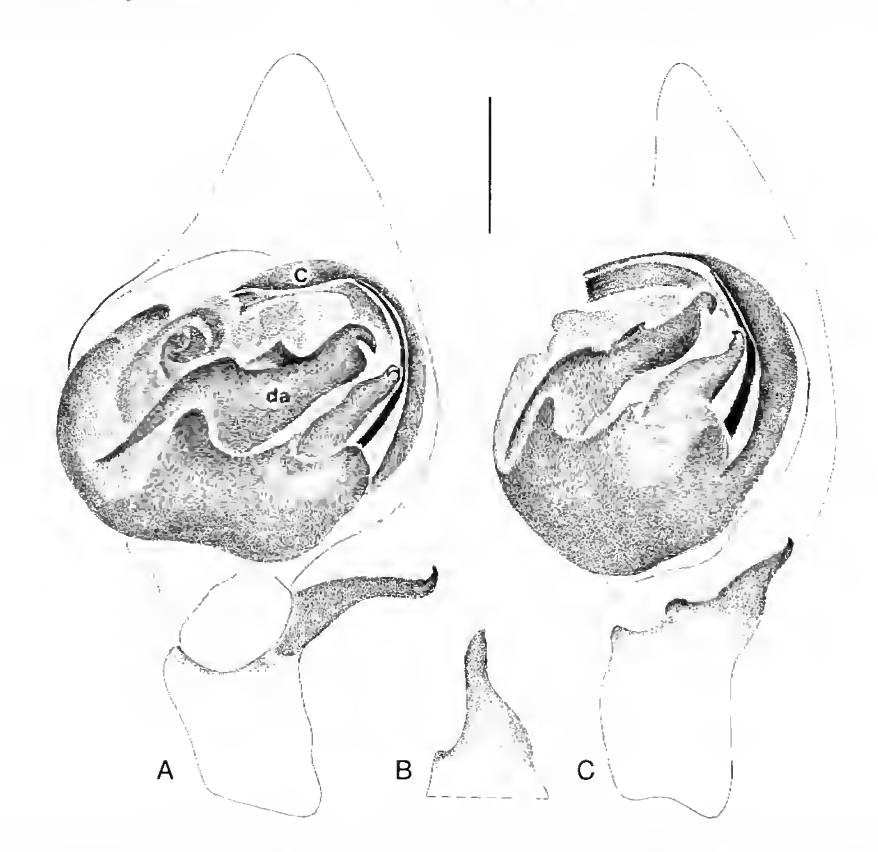


FIG. 29. — *Pisaura mirabilis* ♂, left palpus; **A**, ventral view; **B**, lateral view of tip of tibial apophysis, viewed from below, detail; **C**, nearly lateral view (partly from below). Abbreviations: **C**, conductor, **da**, distal apophysis. Scale bar: 0.5 mm.

mating behaviour where the male presents an enswathed fly to the female to masticate while copulating and serving it again on insertion of its second palpus, was described already by Hasselt (1884, cited and corroborated by Gerhardt 1923: 28-31). Their spherical egg-sac is held for a time with the chelicerae and palpi under the carapace. After the construction of the nursery, the female rests on its walls or nearby until the young emerge. These are grouped for a few days in a close cluster and then disperse in all directions. The young according to Lenler-Eriksen (1969) suspend threads for the detection of prey.

Adult males of *P. mirabilis* in Israel have been collected from February to April and females, often with an egg-sac, were taken from March to May. Although *P. mirabilis* is widely distributed it was merely recorded from Israel. Strand (1914: 185, as *rufofasciata*) was the first (♀ with egg-sac, SMF, 4885; examined) and the next was Brignoli (1984: 36) reporting on females that have been detected among O. P.-Cambridge's (1872) material (HECO, B.1524, t.7; 2 ♀♀ examined). Brignoli (1984), however, on addressing the problematics in identifying the females, separated several forms but overlooked the many

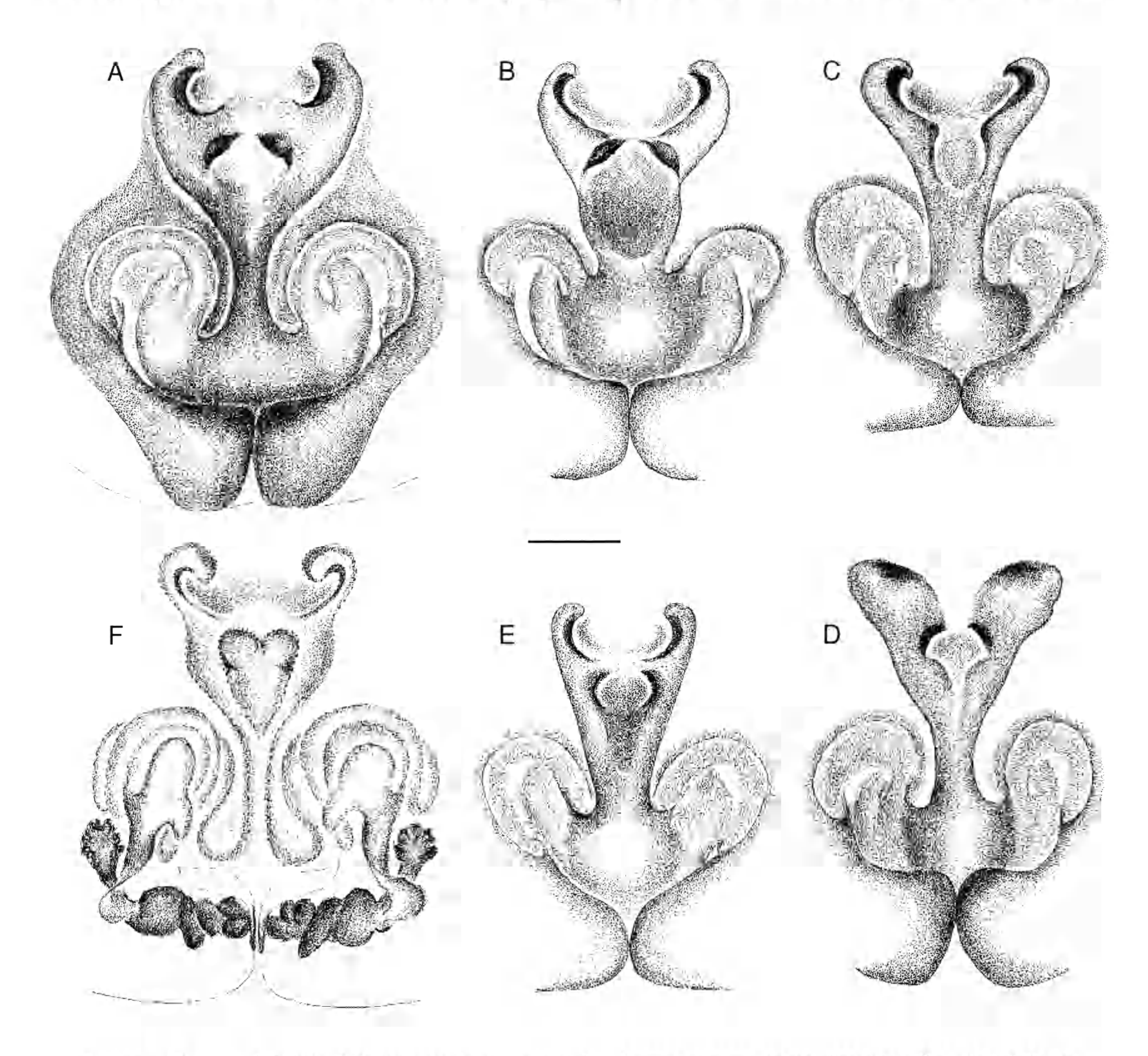


FIG. 30. — *Pisaura mirabilis* ♀; **A**-**E**, various epigyna, ventral view; **F**, spermathecae, dorsal, inner view. Scale bar: 0.25 mm.

intermediate forms found in the same population in the shapes of the epigyna (Fig. 30A-E). His distinctions of the different female species are impractible and their alledged ranges of distribution are rather confused. If there are sibling species in *P. mirabilis* these should not be solely based on females but substantiated by males, e.g. *P. maderiana* Schmitz, 1895 authenticated by Wunderlich (1987: 230, figs 609-610, ♂).

Pisaura consocia (O. P.-Cambridge, 1872)
(Figs 28, 31, 32)

Dolomedes consocius O. P.-Cambridge, 1872: 320; ♂ syntype from the Plains of the Jordan, Israel (HECO, B.1524, t.3; examined).
Pisaura consocia – Simon 1892: 83. – Roewer 1954a: 119. — Bonnet 1958: 3674. – Blandin 1976: 922, figs 11, 14. – Brignoli 1984: 39, figs 12, 14, 16.

DIAGNOSIS. — The shape of the tibial apophysis and sclerites of the male palpus of *P. consocia* and the form of the epigynal plate and spermathecae of the female differ clearly from all other *Pisaura* species.

DISTRIBUTION. — Israel, Lebanon, Syria.

RECORDS. — Israel, throughout northern and central parts.

DESCRIPTION
Male
Measurements (10 ♂♂): total length 7.4-10.3; carapace length 3.4-4.3, width 2.7-3.4, index 1.20-1.29; clypeus index 3.0-3.6; MOQ/cly ratio 1.10-1.29; leg lengths: I 15.5-20.2, II 16.0-20.3, III 12.5-16.6, IV 15.9-20.9; patella-tibia index 1.51-1.69.
Palpus. Blackish retrolateral apophysis widened and scooped at end, terminating with pointed hook (Fig. 31A, B); black conductor, roughened on inner margin, rises upright apically; embolus splits at base into main filament that extends almost to tip of conductor, and short, pointed

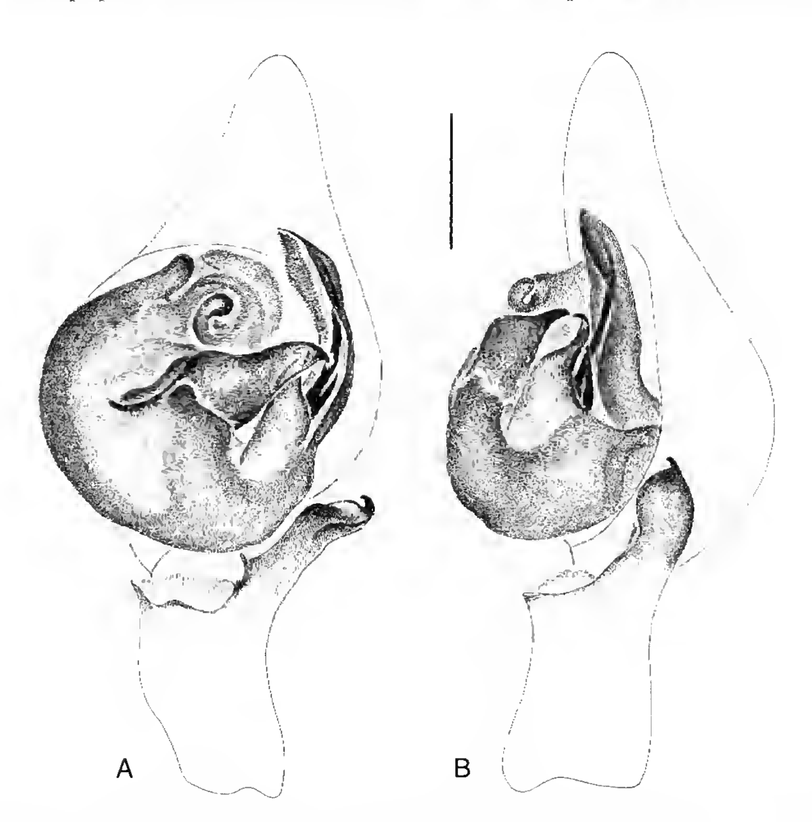


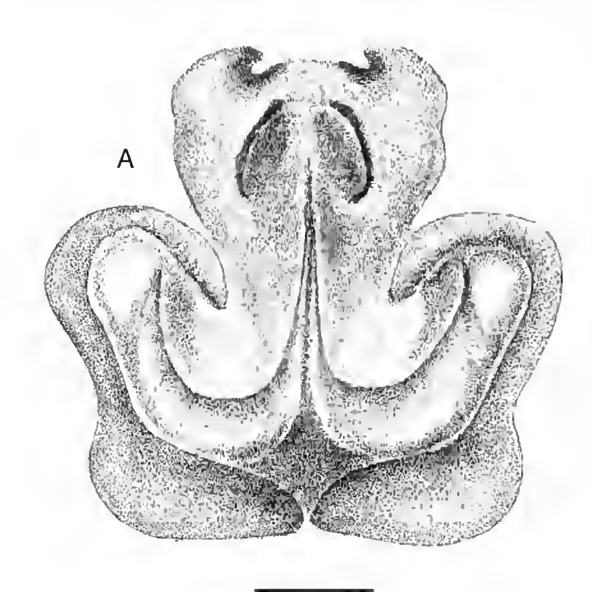
FIG. 31. — *Pisaura consocia* ♂, left palpus; **A**, ventral view; **B**, nearly lateral view, partly from below. Scale bar: 0.5 mm.

stylet (Fig. 31A, B); gradual tapering distal-apophysis extends above hooked median-apophysis.

Female

Measurements (10 ♀♀): total length 7.6-13.9; carapace length 3.5-4.8, width 2.9-3.8, index 1.21-1.29; clypeus index 2.8-3.5; MOQ/cly ratio 1.13-1.37; leg lengths: I 14.5-20.5, II 14.6-20.6, III 12.8-17.9, IV 16.4-23.0; patella-tibia index 1.43-1.56.

Epigynum. Fine tip of ridged median septum extends into anterior cavity edged by brown, arched rims (Fig. 32A); cross-arm of anchor-like septum partly encircles deep depressions on each side; sclerotization of cross-arm may vary slightly, outlines strong or feebly pronounced; shape of spermathecae and inner folds as in Fig. 32B.



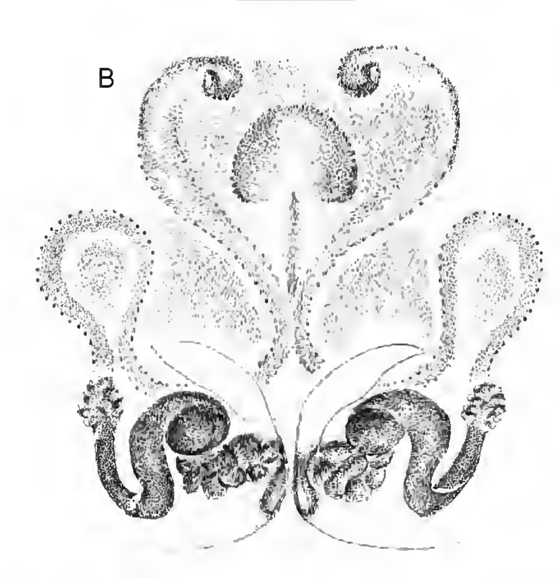


FIG. 32. — *Pisaura consocia* ♀; **A**, epigynum, ventral view; **B**, spermathecae, dorsal inner view. Scale bar: 0.25 mm.

COMMENTS

Adult males are found from February to May and females from February to June. Females with an egg-sac were collected in May. Following the description of *P. consocia* by O. P.-Cambridge (1872: 321) from Israel and Lebanon (Ain Ata), it was recorded from the Middle East by Costa (1875: 30, Jericho), Simon (1892: 83, Jerusalem to Nazareth and Tel el-Kadi = Dan), Pavesi (1895: 9, Mar Saba), Kulczyński (1911: 48-51, pl. 2, figs 57-59, Jerusalem; Beirut, Lebanon), Strand (1913: 160, Jaffa; ♀ SMF, 4875; examined) and Kerville (1926: 69, Beit Meri near Beirut, Lebanon and surroundings of Damascus, Syria).

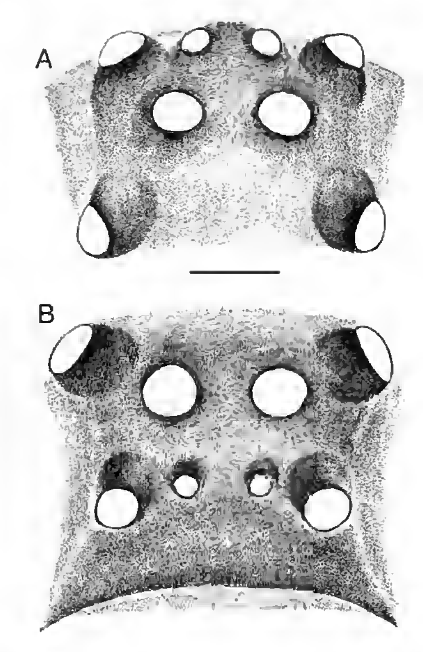


FIG. 33. — *Rothus*, eye arrangement; **A**, dorsal view, detail; **B**, frontal view. Scale bar: 0.5 mm.

Genus *Rothus* Simon, 1898

TYPE SPECIES. — By original designation: *Rothus purpurissatus* Simon, 1898: 294.

DESCRIPTION

Large pisaurids, females may reach over 16 mm in body length. Coloration variable. Carapace longer than wide with relatively narrow clypeus. Anterior row of eyes straight in dorsal view, procurved in frontal view (Fig. 33A, B); anterior-median eyes markedly smaller than all eyes, and posterior-medians largest of all eyes. Median-ocular-quadrangle posteriorly much wider than anteriorly, and over 2 times longer than clypeus height. Labium, endites and cheliceral dentition as in *Pisaura*. Legs long and spinose, formula: IV, II, I, III, or IV, I, II, III. Male palpus bears an embolus that issues on the mesal side and apophyses extending across tegulum (Fig. 34A). Female epigynum comprises a depression edged by lateral oval plates connected posteriorly, along epigastric furrow (Fig. 35A).

REMARKS

The genus *Rothus* has been revised by Blandin (1976, 1977). With several synonymies cleared and available types checked, the validity of only three out of seventeen African species has been proved. The one species found in Israel forms herein the first representative of the genus *Rothus* in Asia.

Rothus purpurissatus Simon, 1898
(Figs 33-35)

Rothus purpurissatus Simon, 1898b: 14; ♀ holotype from Keren, northern Ethiopia, *leg.* Schweinfurth (MNHN, B. 2025, AR. 3254; examined).

Rothus pictus Roewer, 1954b: 210; ♂ and ♀ syntypes from Tete, Mozambique (SMF, RII/10332/82; examined), synonymized by Blandin (1977: 552, figs 10-12, 15-27, 31).

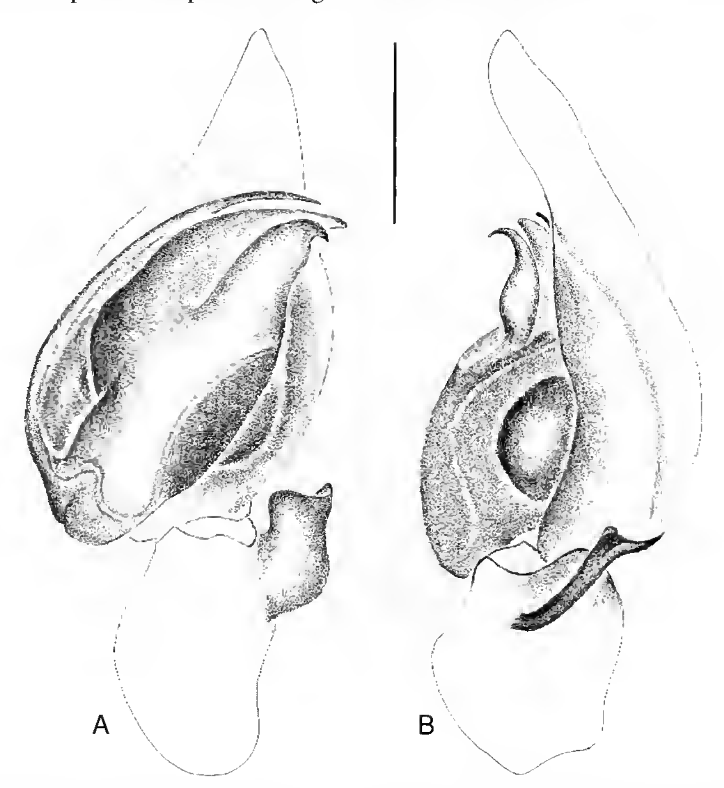


FIG. 34. — *Rothus purpurissatus* ♂ (? allotype) from Mozambique (*R. pictus* Roewer); mirror image of right palpus; **A**, ventral view; **B**, lateral view. Scale bar: 0.5 mm.

DIAGNOSIS. — *Rothus purpurissatus* can be distinguished from all other *Rothus* species by the shape of the tibial apophysis and the tegular apophyses of the male palpus, and by the peculiar epigynum and shape of the spermathecae of the female.

DISTRIBUTION. — South Africa, Mozambique, Angola, Zaïre, Rwanda, Cameroon, Ethiopia, Israel – new record.

RECORDS. — Israel, Banyas, Auja e-Tahta, En Duyuk.

DESCRIPTION

Male

Note: No adult male has been collected thus far in Israel, and drawings provided are of the male (? allotype) *R. pictus* from Mozambique.

Palpus. Relatively small. Apically furrowed tetrolateral apophysis of tibia appears quadrate on ventral view, but slender and pointed in profile (Fig. 34A, B). Surface of cymbium depressed along lateral margin. Inclined tegulum extends into immovably attached apophyses (Fig. 34A, B).

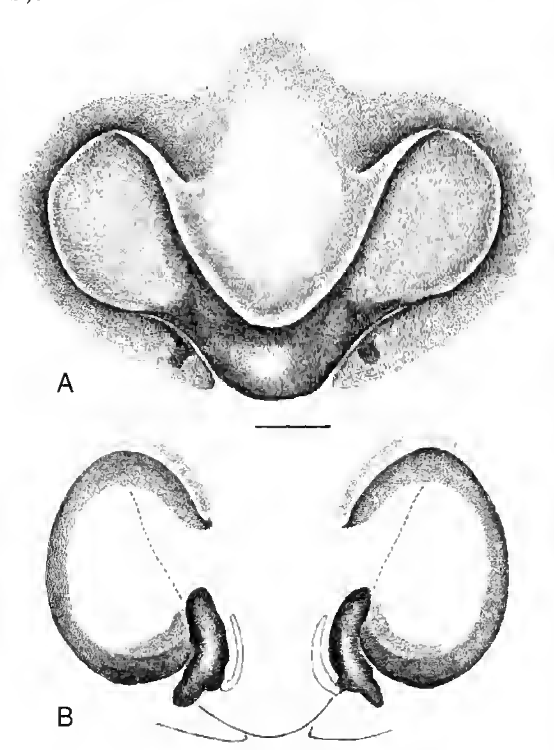


FIG. 35. — *Rothus purpurissatus* ♀; **A**, epigynum, ventral view; **B**, spermathecae, dorsal, inner view. Scale bar: 0.25 mm.

Female

Measurements (6 ♀♀): total length 11.5-16.2; carapace length 5.5-7.6, width 4.5-6.1, index 1.22-1.34; clypeus index 1.9-2.5; MOQ/cly ratio 2.0-2.1; leg lengths: I 22.0-30.5, II 21.5-31.3, III 17.9-25.3, IV 22.4-31.0; patella-tibia index 1.36-1.46.

Epigynum. Relatively large. Bottom of central yellow depression covered with setae. Lateral ovoid, yellow-brown platelets connected medially by thick, black and sclerotic band (Fig. 35A). Spermathecae consist of small, black nearly cylindrical bodies placed at ends of inner, dark, semicircular folds (Fig. 35B).

COMMENTS

Adult females of *R. purpurissatus* have been collected in Israel in May-July and September. All have been found near water along the Rift Valley marking thus the classical route of infiltration of an African element into the local fauna.

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Redescription of *Hippolyte ventricosa* H. Milne Edwards, 1837 based on syntypes, with remarks on *Hippolyte orientalis* Heller, 1862 (Crustacea, Decapoda, Caridea)

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KEY WORDS
Hippolyte ventricosa, *Hippolyte orientalis*, *Hippolyte proteus*. Crustacea, Decapoda, Caridea, Hippolytidae, Indo-Pacific, India, Red Sea, Gulf of Aden, taxonomy, syntypes.

ABSTRACT
The shrimp *Hippolyte ventricosa* H. Milne Edwards, 1837 is redescribed in detail, largely on the basis of syntypes. *H. ventricosa* has been previously recorded in various parts of the Indo-Pacific Ocean but most of these records are probably based on closely related species. For the time being, the true *H. ventricosa* is only known with certainty from India. Subtle but significant differences have been detected beween Indian *H. ventricosa* and its close relative from the Red Sea and the Gulf of Aden, *H. orientalis* Heller, 1862. These two species were previously considered as synonyms. A lectotype is designated for *Hippolyte proteus* (Paul'son, 1875).

MOTS CLÉS
Hippolyte ventricosa, *Hippolyte orientalis*, *Hippolyte proteus*, Crustacea, Decapoda, Caridea, Hippolytidae, Indo-Pacifique, Inde, mer Rouge, golfe d'Aden, taxonomie, syntypes.

RÉSUMÉ
Redescription de Hippolyte ventricosa *H. Milne Edwards, 1837 fondée sur les syntypes, avec des remarques sur* Hippolyte orientalis *Heller, 1862 (Crustacea, Decapoda, Caridea).*
La crevette *Hippolyte ventricosa* H. Milne Edwards, 1837 est redécrite en détail, essentiellement d'après les syntypes. *H. ventricosa* a été signalée en de nombreux points de l'Indo-Pacifique, mais la plupart des signalements antérieurs sont probablement fondés sur des espèces voisines. Pour l'instant, les seuls signalements certains de *H. ventricosa* concernent des spécimens récoltés en Inde. Des différences subtiles mais significatives ont été relevées entre des *H. ventricosa* originaires de l'Inde et sa proche parente de la mer Rouge et du golfe d'Aden, *H. orientalis* Heller, 1862. Ces deux espèces étaient précédemment considérées comme synonymes. Un lectotype est désigné pour *Hippolyte proteus* (Paul'son, 1875).

INTRODUCTION

The systematics of the Indo-Pacific species of the genus *Hippolyte* Leach, 1814 is chaotic (d'Udekem d'Acoz 1996). Many species are only known by very short and totally inadequate original descriptions. There are probably many undescribed species and several distinct species have been obviously lumped together under the name *Hippolyte ventricosa* H. Milne Edwards, 1837 that was previously considered as the commonest and most widespread Indo-Pacific species of the genus (Holthuis 1947; Chace 1997).

The original description of *Hippolyte ventricosa* (as *Hippolyte ventricosus*) by H. Milne Edwards (1837) is extremely short and imprecise: "*Espèce extrêmement voisine de l'H. variable* [*Hippolyte varians* Leach, 1814] *mais dont le rostre ne porte en dessus qu'une seule dent située près de sa base, et dont les prolongements latéraux des trois premiers anneaux de l'abdomen présentent des dimensions très considérables. Longueur, environ 4 lignes* [9 mm]. *Trouvée par M. Dussumier dans les mers d'Asie (C. M.).*" The real identity of H. Milne Edwards' species cannot be established from his description.

Fortunately the type material of the species still exists. Indeed, in the collections of the Muséum national d'Histoire naturelle (MNHN), Paris, I found an old vial with the following typed label: "*Hippolyte ventricosus* Edw., Inde, M. Dussumier." In my opinion these indications clearly demonstrate that the specimens are the syntypes of H. Milne Edwards' species, even if their morphology does not coincide perfectly with the original description. Although almost all walking legs are detached, the specimens are otherwise in a remarkably good condition after a conservation of almost two centuries in alcohol.

Hippolyte ventricosa H. Milne Edwards, 1837 is redescribed hereafter, largely on the basis of syntypes, and is compared with its close relative *Hippolyte orientalis* Heller, 1862 previously considered as a junior synonym of *H. ventricosa* (see Holthuis 1947; d'Udekem d'Acoz 1996; Chace 1997). This study is the first logical step towards a possible revision of the Indo-Pacific species of the genus *Hippolyte*.

The ratios have been calculated according to the method proposed by d'Udekem d'Acoz (1996).

ABBREVIATIONS

MNHN Muséum national d'Histoire naturelle, Paris;
P pereiopod.

SYSTEMATICS

Hippolyte ventricosa H. Milne Edwards, 1837 (Figs 1-4)

Hippolyte ventricosus H. Milne Edwards, 1837: 371. – Kemp 1914: 96, pl. 2, figs 1-3.
? *Hippolyte ventricosus* – Kemp 1916: 391 (no description except for colour pattern).
? *Hippolyte ventricosa* – Tirmizi & Kazmi 1984: 313, fig. 1a-g.
Hippolyte ventricosa – d'Udekem d'Acoz 1996: 108, 112, 115, in part.

MATERIAL EXAMINED. — **India.** M. Dussumier coll., 7 mature ♀♀ in alcohol, in fairly good condition (MNHN Na 1672) [obviously the syntypes of *H. ventricosa*], 1 specimen dissected with first and second maxilla, and first and second maxilliped on permanent microscopical preparation mounted with euparal. — Kilakarai Ramnad District, Tamilnadu, 13-25.II.1913, S. W. Kemp coll., Reg. No. 84 58/10, 1 ♂, 8 ♀♀, 1 juvenile (MNHN Na 4717) [specimens already reported by Kemp (1914)]. — Maharashtra, rocks of Ratnagiri, on brown algae of the genus *Padina*, 19.II.1980, P. Y. Noël coll., 4 ovigerous ♀♀ (MNHN Na 8140).

DESCRIPTION OF SYNTYPES (MATURE FEMALES)
Outline fairly robust (Fig. 1A). Ratio lateral length/height of carapace = 1.7-2.0. Rostrum fairly narrow to high, straight, rather long, slightly shorter or slightly longer than carapace; overreaching antennular peduncle; reaching at most scaphocerite apex. Rostrum without distinct mediolateral carina; two dorsal rostral teeth in proximal position in five specimens, one dorsal rostral tooth in proximal position in two specimens; no subdistal dorsal rostral tooth; no postrostral teeth; base of supraorbital tooth posterior to posterior orbital margin; tip of supraorbital tooth far from reaching the base of first dorsal tooth; one to four ventral teeth on the distal half of the rostrum (Figs 1A, 2A-F). Antennal tooth distinctly overreaching inferior orbital angle (Fig. 2B). Hepatic spine nearly reaching or slightly overreaching anterior edge of carapace.

Pterygostomian angle not strongly protruding (Fig. 1A).

Third pleonite moderately curved in lateral view (Fig. 1A). The slight angular discontinuity on dorsal border of fourth pleonite in the shrimp illustrated on Figure 1A is due to damage and is not present in other syntypes. Ratio dorsal length/height of the sixth pleonite = 1.5-1.9. Distal border of telson with eight strong spines; their length gradually increases from the sides to the center of the distal border of the telson; no intermediate spinules (Fig. 2H). First pair of

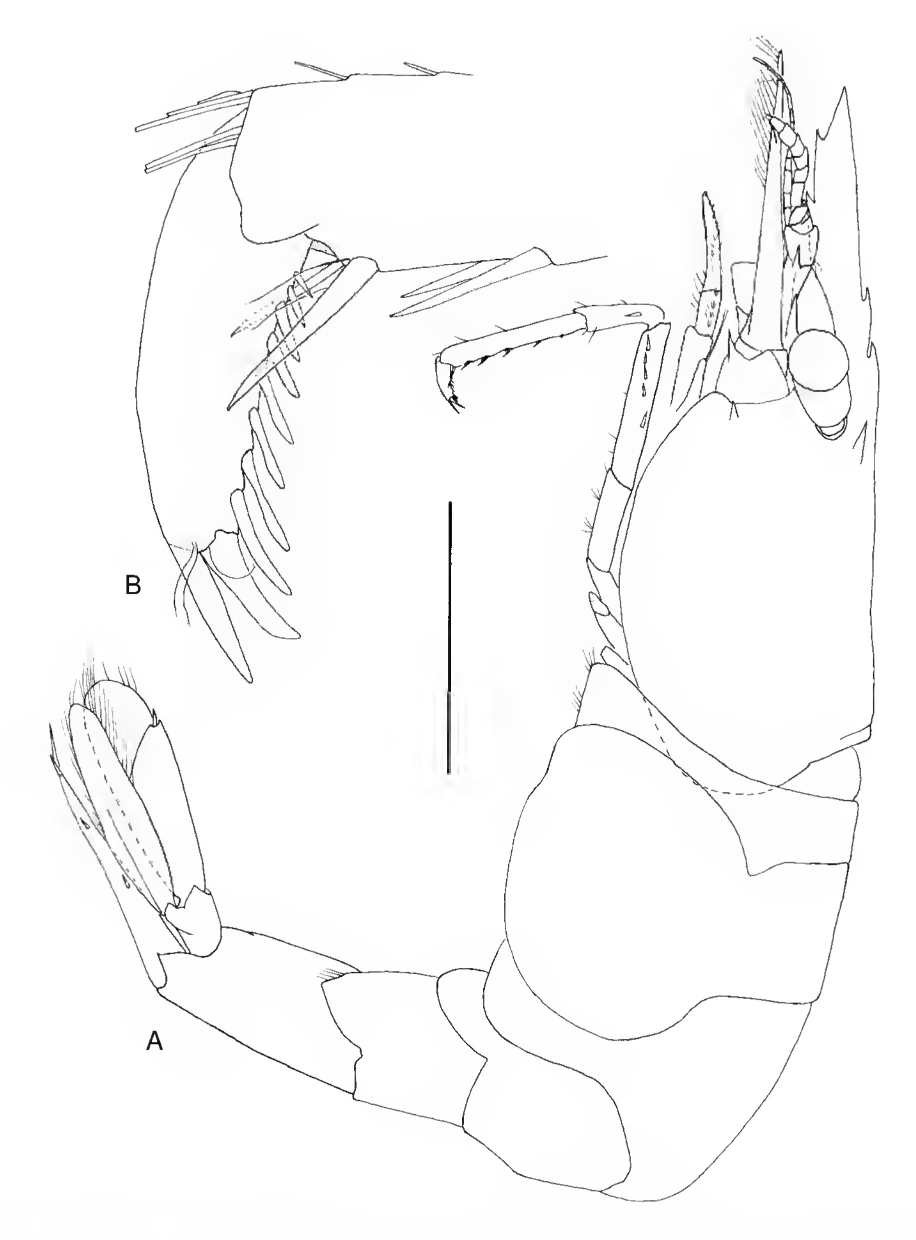


FIG. 1. — *Hippolyte ventricosa* H. Milne Edwards, India, syntype, ovigerous ♀; **A**, shrimp in lateral view ; **B**, dactylus of left third pereiopod. Scale bar: A, 2.0 mm ; B, 0.22 mm.

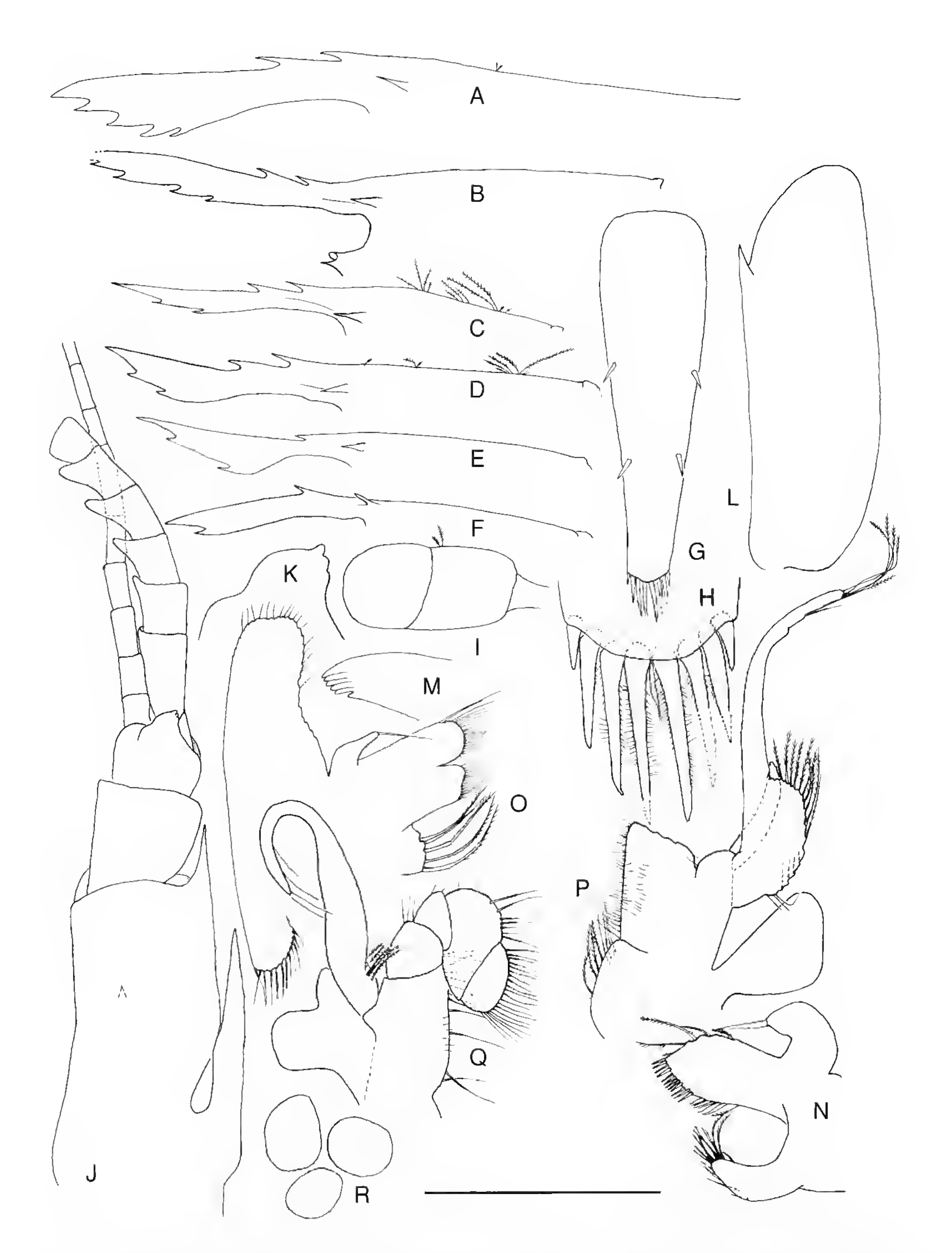


Fig. 2. — *Hippolyte ventricosa* H. Milne Edwards, India, syntypes, ♀♀; **A-F**, rostrum and dorsal part of carapace; **G**, telson; **H**, tip of telson; **I**, left eyestalk in dorsal view; **J**, right antennula; **K**, dorsal tip of third segment of right antennular peduncle; **L**, left scaphocerite; **M**, incisor process of left mandible; **N**, left first maxilla; **O**, right second maxilla; **P**, left first maxilliped; **Q**, right second maxilliped; **R**, eggs in early stage; the illustrated appendages belongs to the specimen with rostrum illustrated on Fig. 2B, except the eyestalk which belongs to the specimen of Fig. 1. Scale bar: A-G, 2.0 mm; I, L, R, 1.3 mm; J, N-Q, 0.68 mm; H, M, 0.34 mm; K, 0.22 mm.

dorsolateral spines between proximal third and middle of telson (Fig. 2G).
Unpigmented part of the eyestalk (measured dorsally from the point where it begins to broaden to the base of cornea) slightly longer than broad and slightly longer than cornea (Fig. 2I). Cornea overreaching or not reaching stylocerite apex. Antennular peduncle reaching 0.5 of scaphocerites. First segment of antennular peduncle with one distal outer tooth; inner ventral tooth on 0.65 of first segment of antennal peduncle (distal outer tooth not considered); stylocerite medium-sized, reaching 0.73 (distal tooth included), 0.87 (distal tooth excluded) of first segment of antennular peduncle in specimen dissected (Fig. 2J). Second segment of antennular peduncle 1.0-1.3 time as long as broad in dorsal view, approximately 1.5 time as long as third segment in dorsal view. Outer antennular flagellum shorter than inner. Scaphocerite 3.1 times as long as wide in specimen dissected; distolateral spine of scaphocerite far from reaching tip of blade; distolateral spine and blade separated by a distinct notch (Fig. 2L).
Mouthparts with morphology typical for the genus *Hippolyte* (Figs 2M-Q, 3A). Mandibular incisor process with six teeth (one mandible examined) (Fig. 2M). Second maxilla with upper margin of scaphognathite straight (Fig. 2O). Epipod of first maxilliped with outer margin straight (Fig. 2P). Epipod of second maxilliped with outer margin distinctly notched (Fig. 2Q). When extended forward, the third maxilliped reaches about 0.4-0.6 of the scaphocerite. Third maxilliped (Fig. 3A) with few rather short apical setae but with nine to eleven large conical spines on its apex and the distal third of its inner border (three specimens examined); its exopod reaches half of antepenultimate segment of endopod; ultimate segment nearly twice as long as penultimate (spines not considered).
Outer edges of fingers of P1 chela not denticulate (Fig. 3C); tip of fixed finger with three massive tooth-like spines; tip of dactylus with four massive tooth-like spines, one being bicuspid (two P1 examined) (Fig. 3B-D).
First segment of P2 carpus distinctly longer than third segment (Fig. 3E), 0.8-0.9 time as long as sum of second and third segments; first segment 2.8-3.8 times as long as wide, second segment 1.1-1.2 time as long as wide, third segment 1.6-2.0 times as long as wide (five P2 measured). Three distal teeth on P2 fixed finger (two bicuspid), four distal teeth on dactylus (two bicuspid), cutting edges not denticulate (one P2 examined) (Fig. 3F).
P3 to P5 long and rather robust, with few setae (Figs 1A, 3G-I). Extended forward, only previously undetached P3 almost reaching scaphocerite apex; with merus 6.1 times as long as wide, carpus 3.8 times as long as wide, propodus 6.9 times as long as wide; merus with five lateral outer spines, carpus with one proximal outer spine, propodus with six pairs of ventral spines of normal length and robustness, dactylus with ten spines (Fig. 1A-B). Detached P3-P5 with zero to six lateral outer spines on merus, one proximal spine on carpus (two spines on one carpus), five to seven pairs of ventral spines on propodus, eight to fourteen spines on dactylus (sixteen P3-P5 examined). Dactylus of normal breadth and length; spines all in one row, in ventral and apical positions (none in dorsal or subdorsal positions); two apical spines; ventral and apical spines of normal length and width (Fig. 1B); ultimate spine apparently partly fused to dactylus (junction of ultimate spine and dactylus difficult to see on microscopical preparations); ultimate spine of P3 dactylus longer than penultimate spine. Ratio length of ultimate spine of P3 dactylus/length of penultimate spine: 1.2. Ratio length of P3 dactylus with longest apical spine/length of propodus: 0.40. Ratio length of P3 dactylus with longest apical spine/length of carpus: 0.65. Ratio length of dactylus without spines/breadth of dactylus without spines: 3.0. Ratio length of dactylus with largest apical spine/breadth of dactylus without spines: 3.9. Ratio length of longest spine of P3 dactylus/breadth of dactylus without spines: 1.1. These ratios have been measured on the only P3 that was still attached. The variability of these ratios in detached P3-P5 is slight.
Most specimens (including all syntypes) with fascigerous setae on their ocular peduncles and often on their body. Number of fascigerous setae very variable.
Eggs small, 0.32-0.44 mm when recently extruded (Fig. 2R).

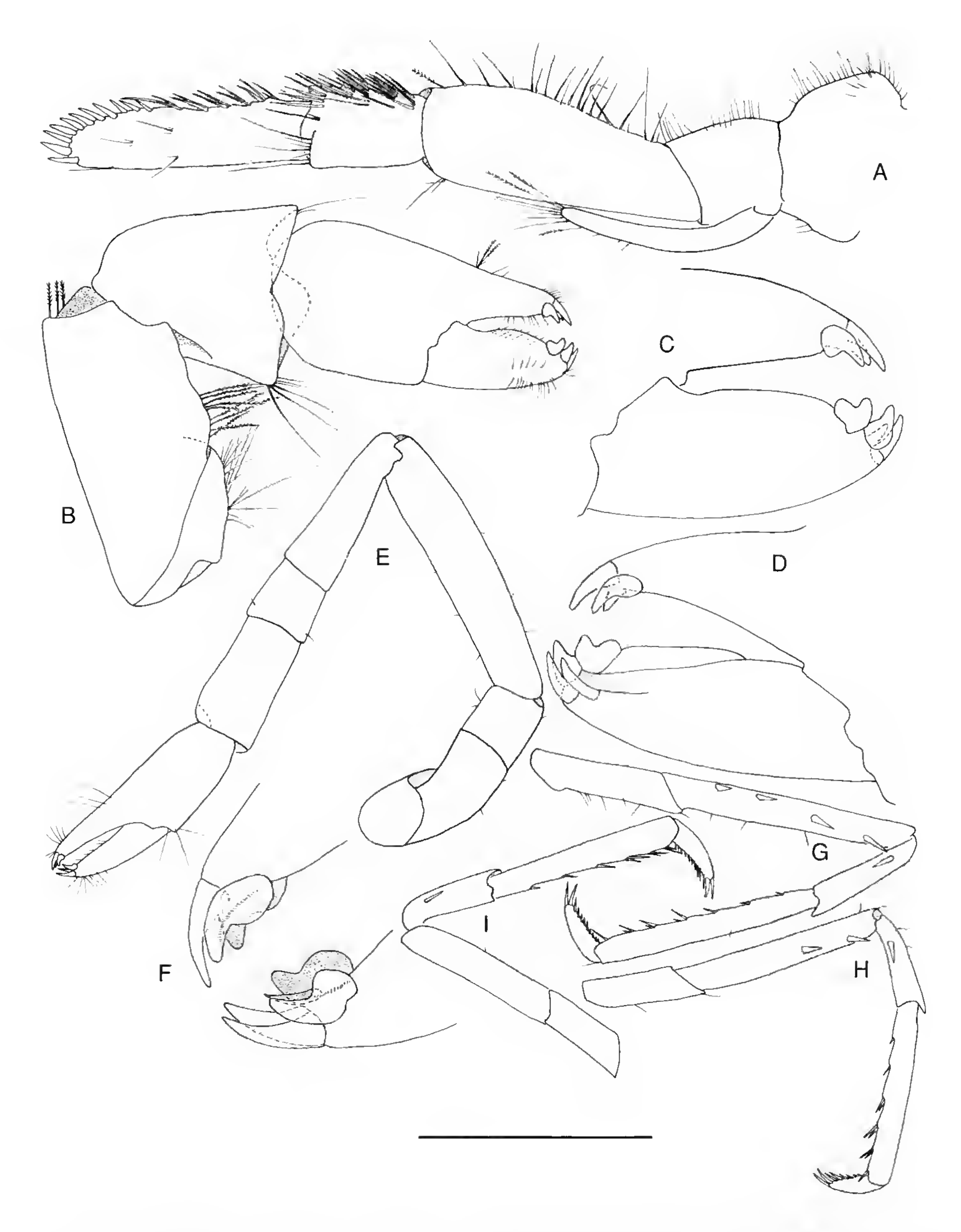


FIG. 3. — *Hippolyte ventricosa* H. Milne Edwards, India, syntypes, ♀♀; **A**, left third maxilliped; **B**, right first pereiopod; **C**, chela of right first pereiopod in outer view (setae not shown); **D**, the same in mesial view; **E**, left second pereiopod; **F**, tip of the chela of left second pereiopod (setae not shown); **G**, probably third right pereiopod; **H**, probably fourth right pereiopod; **I**, probably fifth right pereiopod; all appendages previously detached, except third maxilliped which belongs to the specimen with rostrum illustrated on Fig. 2B. Scale bar: A, B, E, 0.68 mm; C, D, 0.34 mm; G, H, I, 1.3 mm; F, 0.10 mm.

Additional descriptive characters based on non-syntype specimens

Kemp's and Noël's Indian specimens show no significant differences with the syntypes. However most pereiopods are still attached in Noël's specimens, and one male is present in Kemp's material.

In Noël's specimens there are three to five spines on P3 merus, zero to two spines on P4 merus, no spines on P5 merus. The second pleopods of Kemp's male were no longer attached. However, I found the endopodite of a male pleopod in the vial containing Kemp's specimens, obviously the endopodite of the male present in the vial. On this endopodite, the appendix masculina has eleven apical setae and it is much shorter than the appendix interna (Fig. 4A). The P1 of two Kemp's specimens have been examined on high magnification (× 250) and they have the same ornamentation as syntypes. A detached male walking leg was found in the vial containing Kemp's specimens (Fig. 4B-C): it showed no significant morphological differences with females, except the propodal dilatation (that is observed in the males of most *Hippolyte* species).

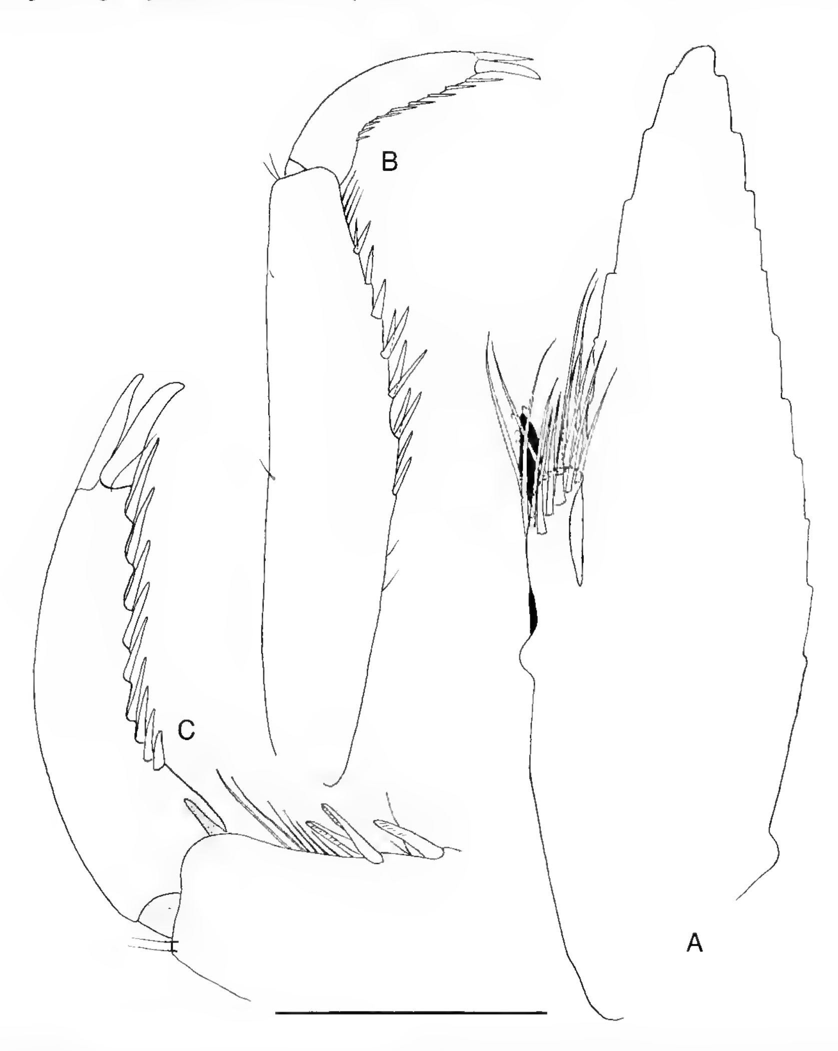


Fig. 4. — *Hippolyte ventricosa* H. Milne Edwards, India, Kilakarai Ramnad District, Tamilnadu, ♂; **A**, detached second pleopod; **B**, propodus of a detached walking leg (probably third pereiopod); **C**, dactylus of the same. Scale bar: A, C, 0.22 mm; B, 0.43 mm.

Colour pattern

"In colour the majority were of a brilliant green; but many other types [...] were observed" (Kemp 1914). If the Kemp's (1916) specimens are correctly identified, *H. ventricosa* can also be dull olive brown.

Measurements

Total length of syntypes up to 17 mm. If Kemp's (1916) specimens are correctly identified, the species can reach up to 21 mm.

Etymology and spelling

There are two spelling mistakes in the name proposed by H. Milne Edwards (1837), *Hippolyte ventricosus*. Indeed the correct Latin spelling of the species name is "*ventriosus*" (= big-bellied) and not "*ventricosus.*" However, the International Code of Zoological Nomenclature (third edition), art. 32 states that in case of incorrect latinization, the original spelling should be maintained. On the other hand the specific name "*ventricosus*" being an adjective, it should be in concord with the genus *Hippolyte* which is feminine. So the species should be named *Hippolyte ventricosa*.

Type series

Since the type series seems morphologically homogenous and since most pereiopods are detached and mixed together, I think that it is preferable to designate no lectotype for the time being.

Ecology

"Living among *Zostera* and other weeds inside the coral reef at depths ranging from low water to two fathoms" (Kemp 1914). If Kemp's (1916) specimens are correctly identified, *H. ventricosa* is also "living in fucoid weeds washed by the waves." Between rocks on brown algae of the genus *Padina* (material collected by P. Y. Noël).

Geographical distribution and remarks

Hippolyte ventricosa is only known with certainty from India. Specimens of Tirmizi & Kazmi (1984) probably belong to the same species: no morphological differences can be detected in their drawings (which are insufficiently detailed) and they were collected in Pakistan, *i.e.* very close to India. Hilgendorf's (1878) *Virbius mossambicus* Hilgendorf, 1878, Barnard's (1950) and Kensley's (1972) *Hippolyte ventricosa* H. Milne Edwards, 1837 from African coasts of Indian Ocean are perhaps true *H. ventricosa* but it is not at all sure. Indeed, the figures of these authors are insufficiently detailed to identify their material. Most other Indo-Pacific records are probably based on other species. Indeed, in many instances significant differences can be detected in published accounts, particularly as concerns the shape and the proportions of scaphocerites, and the length and position of spines on dactylus of P3-P5 (d'Udekem d'Acoz 1996). Furthermore, the observations of Ledoyer (1984) suggests that some Indo-Pacific *Hippolyte* species could have a limited range of geographical distribution and are replaced in different parts of this ocean by vicariant species.

It is premature to propose a key, even preliminary, of the Indo-Pacific *Hippolyte*.

Hippolyte orientalis Heller, 1862
(Fig. 5)

Hippolyte orientalis Heller, 1862: 277.

Virbius proteus Paul'son, 1875: 115, in part: pl. XVI, figs 3(?), 3a, 3b, 3c(?), 3d(?), 3f(?), 5a, 5b, not pl. XVI fig. 4, not pl. XVIII fig. 1 [= *Hippolyte proteus* (Paul'son, 1875)].

Virbius orientalis – Nobili 1906: 33, in part.

Hippolyte ventricosus – Gurney 1927: 391, figs 94, 95; 1936: 25 – Kremer 1990: 34, figs 15-21 (not published).

Hippolyte ventricosa – Holthuis 1947: 55, in part, Red Sea material only, not figs 7-9 (= ? new species); 1958: 33 – d'Udekem d'Acoz 1996: 108, 112, 115, in part.

Material examined. — Gulf of Aden, Djibouti, H. Coutière coll., 109-97, G. Nobili det., 1905, half a dozen badly mutilated specimens and fragments previously mixed together with *Hippolyte proteus* (Paul'son, 1875) (MNHN Na1600).

Systematic position

Hippolyte orientalis was originally described from the Red Sea by Heller (1862). Although without illustrations, the original description is rather good and definitely indicates that it is an *Hippolyte* of the group *ventricosa*. Indeed Heller (1862) indicates that the first segment of anten-

nular peduncle has a distal outer tooth. The type material of *Hippolyte orientalis* has probably been deposited in the Naturhistorisches Museum, Wien and there are good reasons to believe that it is still extant. Indeed the type material of two other *Hippolyte* species described by Heller still exists in this museum: *Hippolyte leptocerus* (Heller, 1863) (d'Udekem d'Acoz 1996) and *Hippolyte gracilis* (Heller, 1862) (Dworschak *in lit.*).

After its original description, *H. orientalis* was recorded in the Red Sea by several carcinologists, under various names. On the other hand it can be assumed that Gurney's (1927) "*Hippolyte ventricosa*" from the Suez Canal are also *H. orientalis* since they come from areas very close to the Red Sea and agree quite well with Heller's description.

H. orientalis was previously considered by all modern authors, including me, as a junior syno-

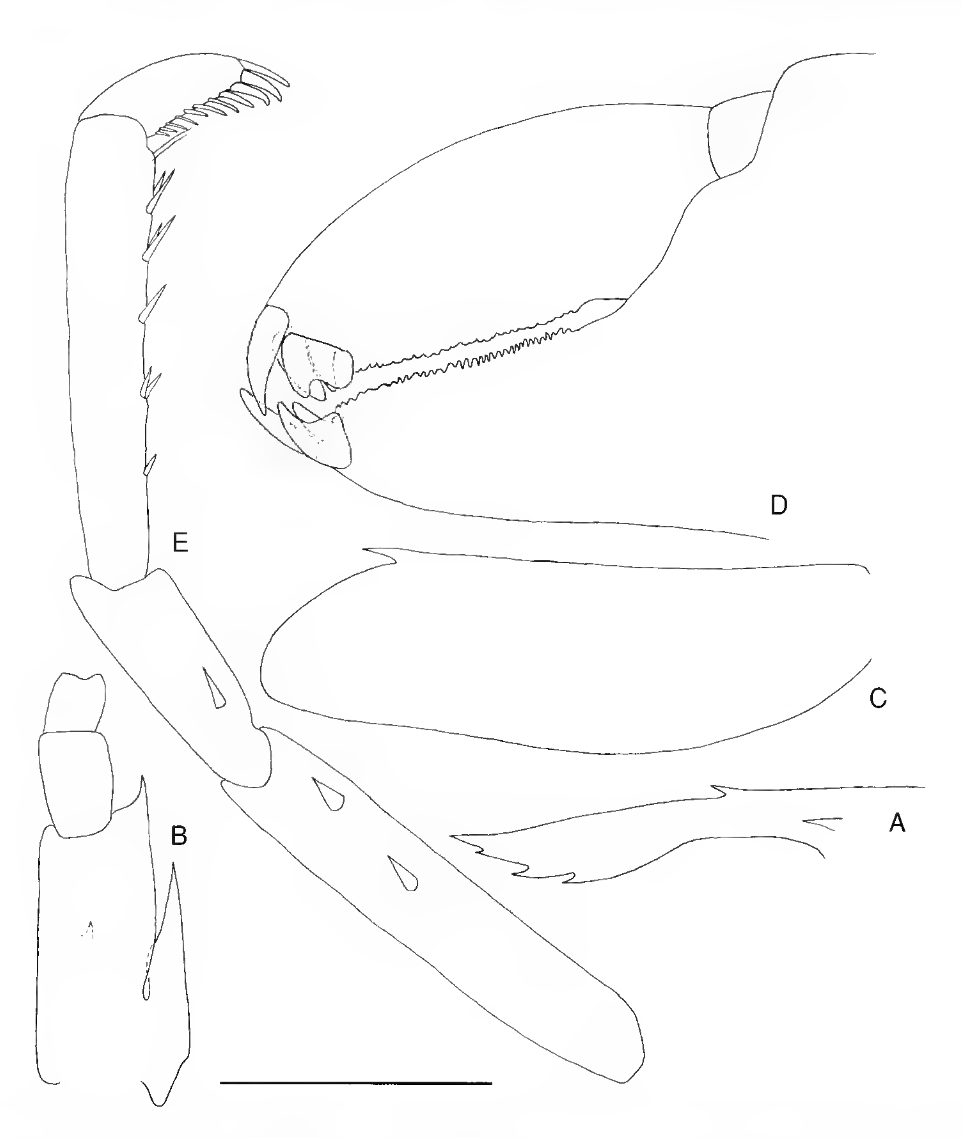


Fig. 5. — *Hippolyte orientalis* Heller, Gulf of Aden, Djibouti, ♀♀; **A**, rostrum; **B**, right antennular peduncle; **C**, right scaphocerite; **D**, chela of right first pereiopod; **E**, third right pereiopod. Scale bar: A, B, C, 1.3 mm; E, 0.68 mm; D, 0.22 mm.

nym of *H. ventricosa*. However, I now consider that both species are probably distinct.
I have reexamined the specimens from Djibouti (Gulf of Aden) reported as *Virbius orientalis* by Nobili (1906) which are housed in the Muséum national d'Histoire naturelle, Paris. Nobili's specimens which are in an extremely bad condition prove to be a mixture of *Hippolyte proteus* (Paul'son, 1875) and of an *Hippolyte* of the group *ventricosa*, a fact that was already suggested by Nobili's (1906) account. Due to the close proximity between the Red Sea and the Gulf of Aden and the biogeographical similarity of these two areas, it is most likely that the Nobili's *Hippolyte* of the group *ventricosa* are *H. orientalis*. Therefore, they are here considered as such.
In the *H. orientalis* examined, the outer edges of the fingers of the P1 chela are minutely but distinctly denticulate (two P1 examined) while they are totally smooth in *H. ventricosa* (four P1 examined: two of syntypes and two of a non-type specimens). The denticulation of the first chela of *H. orientalis* was already pointed out by Kremer (1990) who said: "*Innenseiten der Scherenfinger mit kleinen Zähnen besetzt.*" In the limited material that I have examined, the number of spines on the merus of P3 in *H. orientalis* is always two, *i.e.* lower than in *H. ventricosa*. This fact is also supported by the written account of Gurney (1936) and by a figure of Kremer (1990) [who both used the name *H. ventricosa* for *H. orientalis*]. In all other respects (including ratio length/width of sixth pleonite and the number of apical telson spines), *H. ventricosa* and *H. orientalis* are nearly identical.
The number of meral spines has often an important systematic value in the genus *Hippolyte* although it is known to show slight geographical variations in some species (d'Udekem d'Acoz 1996, 1997). So, the importance of this last character taken alone should be considered with some reserve. On the other hand, there is little doubt that the difference in the ornamentation of the P1 chela is of specific nature. Therefore *H. ventricosa* and *H. orientalis* are here considered as distinct species.
Unfortunately, the extremely poor condition of Nobili's material and the small number of available specimens does not allow a more detailed study. According to Kremer (1990), adult *H. orientalis* have one to three dorsal rostral teeth and one to five ventral rostral teeth (dorsal and ventral teeth can be lacking in juveniles), five to eight teeth on incisor mandibular process, an appendix masculina with eight apical setae and much shorter than the appendix interna.

GEOGRAPHICAL DISTRIBUTION

The geographical distribution of *H. orientalis* cannot be delimited with precision. However, it seems probable that it is not very wide. The species is known to occur in the Red Sea, the Suez Canal and the Gulf of Aden, and in my opinion it is not impossible that it also occurs in the Persian Gulf. This area is well-known for comprising several endemic species and subspecies, often closely related to typical Indo-Pacific forms (Por & Dimentman 1989).

REMARKS

The original description of *Hippolyte proteus* (Paul'son, 1875) is obviously based on two species: *Hippolyte orientalis* Heller, 1862 and the species which is usually named *Hippolyte proteus* in literature. To my knowledge nothing is known as concerns Paul'son's material but it can be assumed that it is probably lost. In order to preserve the stability of nomenclature I designate the specimen of figure 1 of Paul'son's (1875) plate 18 as the lectotype of *Hippolyte proteus*. This illustration shows all the characteristics of the species usually named *Hippolyte proteus*, including the absence of distal outer tooth on the first segment of antennular peduncle.

FURTHER RESEARCHES

Our knowledge of Indo-Pacific *Hippolyte* will probably progress rather slowly. The next logical step should be the detailed redescription of other imperfectly known species. This would be absolutely necessary for the species originally described as *Virbius australiensis* by Stimpson (1860) and its supposed synonym *Caradina cincinnuli* Bate, 1863. Indeed this or these species are only known by a quite rudimentary diagnosis and are

likely to be common in some tropical part of the Indo-Pacific Ocean. If all the type material of *Virbius australiensis* is lost (which is probably the case), it would be necessary to designate a neotype for it. After the study of Stimpson's and Bate's species it will probably be possible to describe several new species. However they will be fairly difficult to describe correctly, some essential characters requiring examination under very high magnifications (for example, the teeth of the chelae). In any case, "preliminary", superficial, imprecise or short descriptions of new species should now be definitely banned.

Acknowledgements
I am very grateful to Dr N. Ngoc Ho (MNHN) for the loan of all the material studied in the present paper and for giving me the authorization to dissect one syntype of *Hippolyte ventricosa* H. Milne Edwards, 1837.

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A new genus and species of hermit crabs (Decapoda, Anomura, Paguridae) from the western Pacific

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ABSTRACT
A new genus is proposed for a new species widely distributed in the western Pacific Ocean from the Philippine Islands in the northwestern Pacific south to Kermadec Islands of New Zealand. *Jacquesia* n.g., bears considerable similarity to *Iridopagurus* de Saint Laurent-Dechancé, 1966, in lacking an accessory tooth on the crista dentata of the third maxilliped, but having eleven pairs of quadriserial gills, slender elongate and subequal chelipeds, and a well-developed left male sexual tube. It is distinguished from *Iridopagurus* by the presence of paired first pleopods in females. The new species is a very distinct, but morphologically variable species. These variations, however, do not appear to be correlated with either size or sex.

KEY WORDS
Crustacea,
Decapoda,
Anomura,
Paguridae,
new genus,
new species,
western Pacific.

RÉSUMÉ

Un nouveau genre de Paguridae (Crustacea, Decapoda, Anomura) pour une nouvelle espèce du Pacifique occidental.

Un nouveau genre de la famille des Paguridae est établi pour une espèce nouvelle, très largement répandue dans le Pacifique occidental, depuis l'archipel des Philippines au nord jusqu'à celui des Kermadec (Nouvelle-Zélande) au sud. Ce nouveau taxon appartient au groupe des Paguridae à onze paires de branchies quadrisériées, dont l'ischion des troisièmes maxillipèdes est dépourvu de dent accessoire à la crista dentata et dont les mâles possèdent un tube sexuel bien développé à gauche. Bien qu'il se distingue immédiatement des autres genres du même groupe par la possession de pléopodes pairs sur le premier segment abdominal des femelles, il présente de nombreuses similitudes avec le genre ouest-atlantique *Iridopagurus* de Saint Laurent-Dechancé, 1966. Bien caractérisée, l'espèce nouvelle est cependant morphologiquement très variable. Les variations observées concernent particulièrement la dimension et la forme du tube sexuel mâle, la forme et l'ornementation des mains des chélipèdes. Apparemment indépendantes de la taille ou du sexe des spécimens, elles paraissent plutôt en relation avec leur origine géographique et/ou leur habitat.

MOTS CLÉS
Crustacea,
Decapoda,
Anomura,
Paguridae,
genre nouveau,
espèce nouvelle,
Pacifique occidental.

INTRODUCTION

Specimens representing this new genus and species were first observed by the senior author among the collections of the Musorstom Philippines II Expedition of 1980. Numerous specimens were subsequently found by the second author in the collections of the Musorstom cruises to the environs of New Caledonia and Vanuatu, 1984-1995. Although it was the authors' initial intent to include this monotypic new genus in a full report of Musorstom taxa, their discovery of its occurrence in the Kermadec Islands of New Zealand, and need to include it in the forthcoming New Zealand faunal monograph, has made its more immediate publication necessary. The new genus is diagnosed, and its relationship to other pagurid genera discussed. The new species is described in detail. Pertinent aspects of its morphology are illustrated, including cheliped variation.

MATERIALS AND METHODS

Materials for this study have come primarily from MUSORSTOM (acronym for the joint expeditions by the Muséum national d'Histoire naturelle, Paris, and the Office de la Recherche Scientifique et Technique Outre-Mer) cruises, with the Kermadec Islands specimens provided by the National Museum of New Zealand (NMNZ) [now Museum of New Zealand Te Papa Tongarewa (MoNZ)] and the New Zealand Oceanographic Institute (NZOI) (now part of the National Institute of Water and Atmospheric Research (NIWA)]. One measurement, shield length (sl), measured from the midpoint of the rostral lobe to the midpoint of the posterior margin of the shield provides an indication of animal size. Terminology follows that of McLaughlin & de Saint Laurent (1998).

Not all specimens examined are types. The holotype and selected paratypes and most non-type specimens have been deposited in the Muséum national d'Histoire naturelle, Paris (MNHN), or returned to their institutions of origin. Additional paratypes have been deposited in the New Zealand Oceanographic Institute, the Natural Museum of Natural History, Smithsonian Institution, Washington, D.C. (USNM), and The Natural History Museum, London (NHM). MUSORSTOM station data have been taken primarily from the published

cruise records (Forest 1985; Richer de Forges 1990, 1993; Richer de Forges & Chevillon 1996; Richer de Forges *et al.* 1996).

The following abbreviations identify campaign, sample type or gear:

BS bottom sample;
CP beam trawl;
DC Charcot dredge;
DW Waren dredge;
SMIB Substances Marines d'Intérêt Biologique.

SYSTEMATICS

Jacquesia n.g.

TYPE SPECIES. — *Jacquesia polymorpha* n.sp., by present designation and monotypy.

ETYMOLOGY. — Named for Professor Jacques Forest, in recognition of his many contributions to crustacean morphology and systematics in general and to pagurids in particular. Gender feminine.

DIAGNOSIS

Eleven pairs of quadriserial gills. Rostrum rounded, usually produced only slightly beyond bases of ocular acicles. Lateral projections prominent. Ocular peduncles moderately slender basally, expanded distally; corneae somewhat dilated. Ocular acicles narrowly triangular, terminating acutely, with strong submarginal spine. Antennular peduncles usually with elongate ultimate segment fringed with long setae near dorsodistal margin and longitudinal row of long setae dorsolaterally. Endopod of maxillule with very prominent, non-recurved external lobe. Third maxilliped with well-developed crista dentata, without accessory tooth; merus with very long slender spine on dorsodistal margin.

Chelipeds subequal in length, right stronger, but not always longer.

Ambulatory legs with elongate, slender dactyls; carpi (at least second) with row of spines on dorsal margin but not at dorsodistal angle. Fourth pereopods subchelate or very weakly semichelate, with single row of scales in propodal rasp. Fifth pereopods subchelate.

Males with club-like, stout, very short to moderately long left sexual tube, provided with terminal tufts of very long setae and additional longitudinal row of long setae basally; coxa of right fifth pereopod with small anteromesially-placed gonopore; three unequally biramous left pleopods. Females with paired gonopores; coxae of fifth pereopods with fringe of moderate to dense long setae; paired first pleopods, unpaired left pleopods 2-5.

Uropods markedly asymmetrical. Telson with weak transverse indentation suggesting division into anterior and posterior portions; posterior lobes asymmetrical, left largest; terminal margins very oblique, each with well-developed spines; posterolateral margins each with calcified plate.

REMARKS

In having eleven pairs of quadriserial gills, *Jacquesia* demonstrates the plesiomorphic lamellar condition (cf. de Saint Laurent-Dechancé 1966b) that is also seen in *Iridopagurus* de Saint Laurent-Dechancé 1966, and *Turleania* McLaughlin, 1997. Males of all three genera have a well-developed left sexual tube; however, while the tube terminates with a sparc tuft of setae in *Turleania*, in the presently monotypic *Jacquesia*, the tip is practically obscured by tufts of long dense setae. Although all three genera also lack an accessory tooth on the crista dentata of the third maxilliped, it is with *Iridopagurus* that *Jacquesia* appears to have the closest phylogenetic relationship. Species of both genera have moderately short ocular peduncles with somewhat dilated corneas; the ocular acicles are narrowly triangular. The antennular peduncles (Fig. 1A) commonly are provided with a distal row of long setae on the ultimate segment, as well as a prominent lateral spine on the statocyst lobe of the basal segment. In the structure of the mouthparts (Fig. 1B-F), the external endopodal lobe of the maxillule is more strongly developed in *Jacquesia* than in *Iridopagurus*, as illustrated by de Saint Laurent-Dechancé (1966a) for *Iridopagurus iris* (A. Milne Edwards, 1880), but the basally swollen and distally rod-shaped exopod of the first maxilliped is virtually identical in the two genera. Species of both genera also have a very prominent meral spine on the third maxilliped. Similarities are found as well in the shapes and

armature of the chelipeds and ambulatory legs in species of both; however, only in *Jacquesia* are females provided with paired first pleopods.

Jacquesia polymorpha n.sp.
(Figs 1-4)

TYPE MATERIAL. — Holotype: ♂, 5.0 mm (MNHN Pg 5655), Vanuatu, Musortom 8, stn CP 1084, 15°50'S, 167°17'E, 207-280 m.
Paratypes: 1 ♂ 3.4 mm, 1 ovigerous ♀, 4.7 mm (USNM 261450) Chesterfield Islands, Musorstom 5, stn CP 311, 22°14'S, 159°23.9'E, 320 m.
– 1 ♂, 4.9 mm (MNHN Pg 5656), Chesterfield Islands, Chalcal 1, stn DC 68, 22°34.2'S, 159°15.5'E, 296 m.
– 1 ♂, 2.6 mm, 1 ♀, 3.6 mm (NHM), Chesterfield Islands, Musorstom 5, stn DW 255, 25°15.4'S, 159°54.8'E, 280-295 m.
– 3 ♂♂, 3.4-4.2 mm, 3 ♀♀, 2.0-3.7 mm, 1 ovigerous ♀, 3.5 mm (MNHN Pg 5656), New Caledonia, Smib 5, stn DW 88, 22°18.6'S, 168°40.2'E, 35 m.

ETYMOLOGY. — From the Latin *polus*, meaning much or many, and *morphe*, meaning form or shape and referring to the great morphological variability seen in this species.

MATERIAL EXAMINED. — **Philippine Islands.** Musorstom 2, stn 54, 27.XI.1980, 13°59.5'N, 120°09.3'E, 170-174 m, 1 ♂, 4.2 mm (MNHN Pg 5652). — Stn 57, 28.XI.1980, 18°51.9'N, 120°03.7'E, 132-156 m, 2 ♂♂, 3.7 mm, 4.2 mm (MNHN Pg 5654). — Stn 61, 29.XI.1980, 14°00'N, 120°16.4'E, 1 ovigerous ♀, 4.5 mm (MNHN Pg 5653).
New Caledonia, Norfolk and Loyalty Ridges. Musorstom 4, stn DW 184, 18.IX.1985, 19°04'S, 163°27.5'E, 260 m, 3 ♂♂, 2.6-3.7 mm, 3 ovigerous ♀♀, 4.3-4.8 mm (MNHN Pg 5675).
Musorstom 6, stn DW 479, 22.II.1989, 21°09.1'S, 167°54.95'E, 310 m, 1 ♀, 2.9 mm (MNHN Pg 5681).
Northwest Lagoon, stn 1051, 4.V.1988, 20°11.8'S, 164°10.5'E, 11-12 m, 1 ♀, 3.3 mm (MNHN Pg 5658).
Chalcal 2, stn DW 69, 27.X.1986, 24°44'S, 168°08'E, 260 m, 1 ♂, 2.2 mm (MNHN Pg 5661).
Smib 3, stn DW 18, 23.V.1987, 23°42'S, 167°59'E, 338 m, 2 ♂♂, 2.5 mm, 4.5 mm (MNHN Pg 5662).
Smib 4, stn DW 42, 8.III.1989, 24°45.7'S, 168°08.4'E, 320 m, 1 ♂, 2.6 mm (MNHN Pg 5663). — Stn DW 44, 8.III.1989, 24°46'S, 168°08.2'E, 300 m, 2 ♂♂, 2.2-4.6 mm (MNHN Pg 5664). — Stn DW 46, 8.III.1989, 24°46.7'S, 168°08.5'E, 260 m, 1 ♂, 3.4 mm, 1 ovigerous ♀, 2.9 mm (MNHN Pg 5665).
Smib 5, stn DW 87, 11.IX.1989, 22°18.7'S, 168°41.3'E, 370 m, 1 ♂, 2.3 mm (MNHN Pg 5666). — Stn DW 88, 11.XI.1989, 22°18.6'S, 168°40.2'E, 350 m, 3 ♂♂, 3.4-4.2 mm, 3 ♀♀, 2.0-3.7 mm, 1 ovigerous ♀, 3.5 mm (paratypes) (MNHN Pg 5657).
Smib 8, stn DW 155, 28.I.1993, 24°45'S, 168°08'E, 257-262 m, 1 ovigerous ♀, 2.7 mm (MNHN Pg 5667). — Stn DW 157, 28.I.1993, 24°46'S, 168°08'E, 251-255 m, 1 ♂, 4.7 mm, 1 ♀, 3.0 mm (MNHN Pg 5668). — Stn DW 158, 28.I.1993, 24°46'S, 168°02'E, 262-290 m, 1 ♀, 2.6 mm (MNHN Pg 5669). — Stn DW 165, 28.I.1993, 24°.48'S, 168°10'E, 372-660 m, 1 ♂, 4.7 mm (MNHN Pg 5670). — Stn DW 175, 29.I.1993, 23°41'S, 168°00'E, 235-240 m, 1 ♂, 3.7 mm (MNHN Pg 5671). — Stn DW 182, 31.I.1993, 23°18'S, 168°05'E, 314-340 m, 1 ovigerous ♀, 5.7 mm (MNHN Pg 5672).
Smib 10, stn DW 209, 10.I.1995, 24°49'S, 168°09'E, 329-560 m, 1 ♂, 3.6 mm, 1 ovigerous ♀, 6.6 mm (MNHN Pg 5673). — Stn DW 210, 10.I.1995, 24°49'S, 168°09'E, 308-510 m, 1 ♂, 3.2 mm (MNHN Pg 5674).
Volsmar, stn DW 40, 8.VI.1989, 22°20'S, 168°42.2'E, 295 m, 1 ♂, 4.9 mm, 1 ♀, 2.6 mm (MNHN Pg 5682).
Beryx 11, stn DW 18, 16.X.1992, 24°47.90'S, 168°09.05'E, 250-270 m, 2 ♂♂, 2.2-4.6 mm (MNHN Pg 5687).
Bathus 4, stn DW 924, 7.VIII.1994, 18°54'S, 163°24'E, 344-360 m, 1 ovigerous ♀, 3.6 mm (MNHN Pg 5688). — Stn DW 936, 8.VIII.1994, 19°03'S, 163°28'E, 258-252 m, 1 ♀, 4.0 mm (MNHN Pg 5689). — Stn CP 939, 8.VIII.94, 18°58'S, 163°25'E, 304-320 m, 1 ♀, 4.0 mm (MNHN Pg 5690). — Stn DW 940, 8.VIII.1994, 18°59'S, 163°25'E, 305 m, 4 ♂♂, 3.1-3.8 mm, 1 ♀, 2.0 mm, 1 ovigerous ♀, 3.3 mm (MNHN Pg 5691). — Stn DW 942, 8.VIII.1994, 19°04'S, 163°27'E, 270-264 m, 2 ♂♂, 3.7, 4.1 mm, 1 ovigerous ♀, 4.3 mm (MNHN Pg 5692).
Halical 1, stn DW 04, 28.XI.1994, 18°55'S, 163°24'E, 350-365 m, 1 ovigerous ♀, 3.6 mm (MNHN Pg 5683).
Chesterfield Islands and Lord Howe Ridge. Chalcal 1, stn CP17, July 1984, 28°34.7'S, 159°15.3'E, 295 m, 1 ♂, 3.7 mm (MNHN Pg 5659). — Stn DC61, 26.VII.1984, 21°42.4'S, 159°29'E, 50 m, 1 ♂, 3.6 mm, 2 ♀♀, 2.6, 3.9 mm (MNHN Pg 5660). — Stn DC 68, 27.VII.1984, 22°34.2'S, 159°15.5'E, 296 m, 1 ♂, 4.9 mm (paratype) (MNHN Pg 5656).
Musorstom 5, stn DW 255, 7.X.1986, 25°15.4'S, 159.54.8'E, 280-295 m, 1 ♂, 2.6 mm, 1 ♀, 3.6 mm (paratypes) (NHM 5676). — Stn CP 311, 12.X.1986, 22°14'S, 159.23.9'E, 320 m, 1 ♂, 3.4 mm, 1 ovigerous ♀, 4.7 mm (paratypes) (USNM 261450). — Stn CP 312, 12.X.1986, 22°17.2'S,

159.24.8'E, 315-320 m, 2 ♂♂, 3.1, 3.2 mm, 2 ♀♀, 1.2, 2.8 mm, 2 ovigerous ♀♀, 3.7, 3.8 mm (MNHN Pg 5677). — Stn CP 318, 13.X.1986, 22°26.5'S, 159.21.4'E, 330 m, 1 ♂, 3.4 mm, (MNHN Pg 5678. — Stn DW 361, 19.X.1986, 19°52.5S, 158.38.1'E, 400 m, 1 ♂, 2.2 mm (MNHN Pg 5679). — Stn DW 378, 20.X.1986, 19°53.7'S, 158°38.3'E, 355 m, 1 ♂, 3.6 mm (MNHN Pg 5680).

Vanuatu Archipelago. Musorstom 8, stn DW 963, 21.IX.1994, 20°20'S, 169°49'E, 400-440 m, 1 ovigerous ♀, 4.0 mm (MNHN Pg 5684). — Stn DW 964, 21.IX.1994, 20°19'S, 169°49'E, 360-408 m, 1 ovigerous ♀, 3.9 mm (MNHN Pg 5685). — Stn DW 1070, 4.X.1994, 15°36'S, 167°16'E, 184-190 m, 1 ♀, 3.4 mm (MNHN Pg 5686). — Stn CP 1084. 5.X.1994, 15°50'S, 167°17'E, 207-280 m, 1 ♂ (holotype), 5.0 mm (MNHN Pg 5655).

Kermadec Islands, New Zealand. Stn K 857, 30.VII.1974, 30°33.8'S, 17830.6'W, 165-180 m, 1 ♂, 3.9 mm (NZOI). — Stn BS 571, 16.IX.1975, 29°18.9'S, 177°54.2'W, 274-210 m, 1 ♂, 4.4 mm, 1 ♀, 4.6 mm (NMNZ).

DISTRIBUTION. — Philippine Islands: northwest of Mindoro, New Caledonia, Norfolk and Loyalty Ridges, Chesterfield Islands, Vanuatu archipelago, Kermadec Islands. Most commonly between 150 and 400 m, but reported from 11 to 660 m (see "Remarks").

HABITAT. — Found occupying gastropod shells.

DIAGNOSIS

Shield usually as broad or broader than long, occasionally slightly longer than broad. Rostrum usually produced but not reaching beyond level of lateral projections; broadly rounded, occasionally nearly obsolete. Ocular peduncles 0.65 to nearly entire length of shield; corneas slightly dilated; ocular acicles each with prominent submarginal spine. Antennular peduncles overreaching distal margins of cornea by half or more than half length of ultimate segment; ultimate segment usually with row of long setae adjacent to dorsodistal margin and longitudinal row of long setae on dorsolateral surface. Antennal peduncles overreaching distal margins of corneas by up to half length of ultimate segment. Antennal acicles reaching to or beyond distal margins of corneas.

Chelipeds both with dense covering of long and frequently also short setae on chelae and carpi, at least partially concealing armature. Right cheliped with dactyl and fixed finger frequently roundly or acutely triangular in dorsal view. Palm with single or double row of short to long, slender to moderately stout spines of both dorsomesial and dorsolateral margins, dorsal surface with several irregular longitudinal rows of small spines or spinules, extending onto dorsolateral surface of fixed finger. Carpus with spines on dorsomesial and dorsolateral margins; lateral face frequently with few small spines, particularly in ventral half. Merus with two to five acute spines on ventrolateral distal margin; blunt or subacute protuberance at ventromesial angle; ventral surface often with few small spines or spinules. Left cheliped often equalling, sometimes exceeding, right in length but less robust; chela often narrowly to roundly triangular in dorsal view. Palm with row of slender, short to quite long spines on both dorsomesial and dorsolateral margins, dorsal surface with numerous irregular longitudinal rows of small spines and spinules extending at least onto proximal half of fixed finger. Carpus subtriangular; dorsomesial margin with row of moderate to long acute spines usually second short row of smaller spines on sloping dorsolateral face; somewhat rounded ventrolateral margin with irregular single or double row of spines, lateral face frequently with several smaller spines on ventral half. Merus with one spine on dorsodistal margin; ventrolateral margin with two to five acute spines on distal half, ventromesial margin with one to three subacute spines near distal angle.

Ambulatory legs similarly armed from left to right, but segments proportionally dissimilar. Dorsal margins of dactyls each with row of long bristle-like setae, mesial faces with covering of long stiff setae and dorsally accompanied by row of pinnate, spiniform setae in proximal half, mesial faces ventrally and/or ventromesial margins each with seven to ten shorter spiniform setae. Carpi each with row of five to twelve spines dorsal surface, spines of third pereopods usually smaller and sometimes fewer in number. Meri of second pereopods each with two to five small spines or spinules in distal half of ventral margins; third unarmed.

Coxae of left fifth pereopods in males with thick, short to moderately long, setose sexual tube

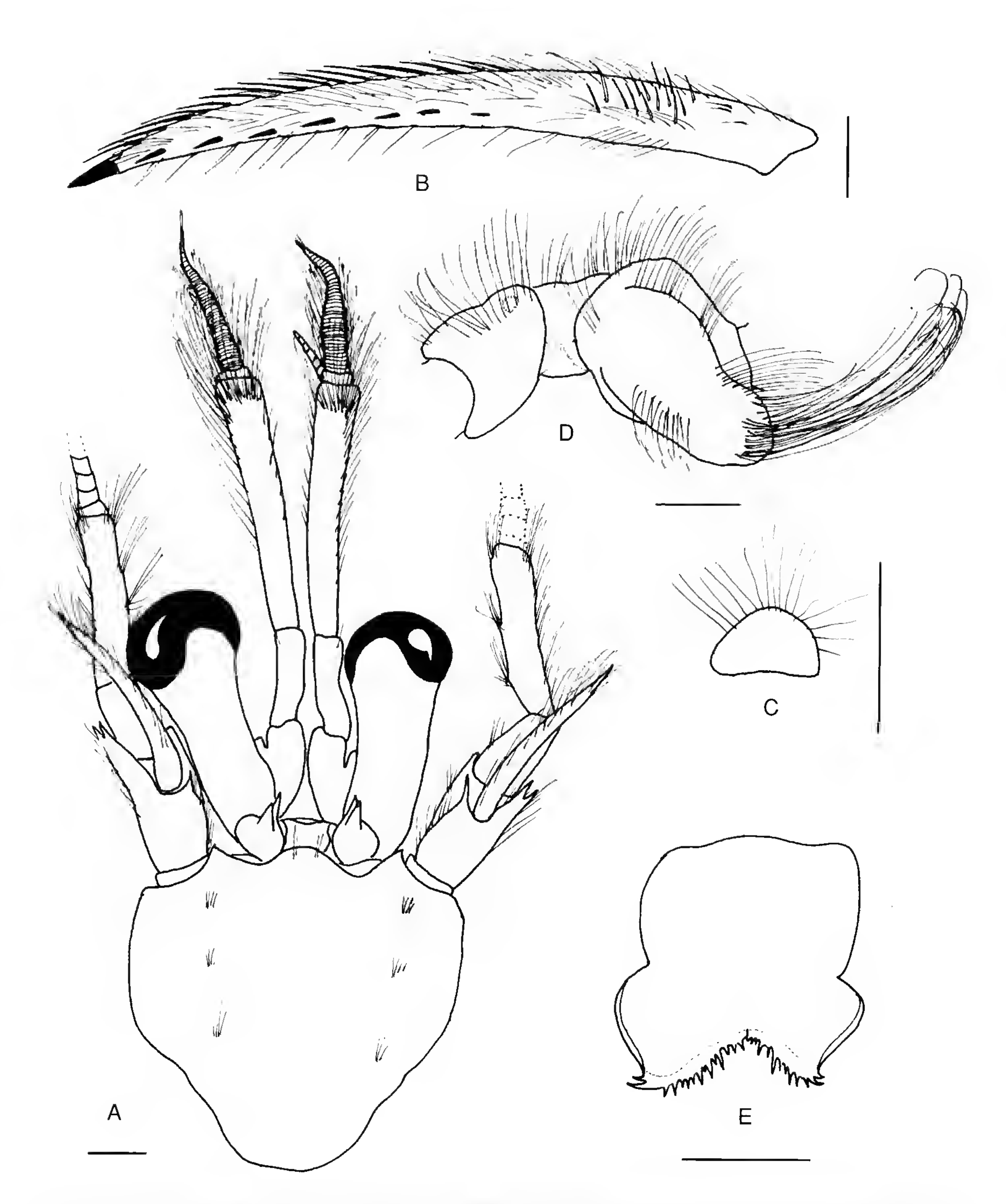


FIG. 1. — *Jacquesia polymorpha* n.sp., holotype ♂, 5.0 mm (MNHN Pg 5655); **A**, shield and cephalic appendages; **B**, dactyl of right second pereopod (mesial view); **C**, anterior lobe of fifth thoracic somite (between Mxp3); **D**, coxae and sternite of last thoracic somite; **E**, telson. Scale bars: 1.0 mm.

directed posteriorly toward exterior. Telson with one to three prominent, curved or hooked spines on each outer angle; terminal margins oblique, each with row of smaller acute spines.

DESCRIPTION

Shield (Fig. 1A) as broad to 1.2 broader than long, occasionally slightly longer than broad; anterior margin between rostrum and lateral projections concave; anterolateral margins sloping, slightly terraced or weakly concave; posterior margin truncate; dorsal surface with few tufts of setae anteriorly and laterally. Rostrum usually produced but not reaching beyond level of lateral projections; broadly rounded, occasionally nearly obsolete. Lateral projections well-developed, subacutely or acutely triangular, usually with marginal or submarginal spine, sometimes only corneous-tipped spinule.

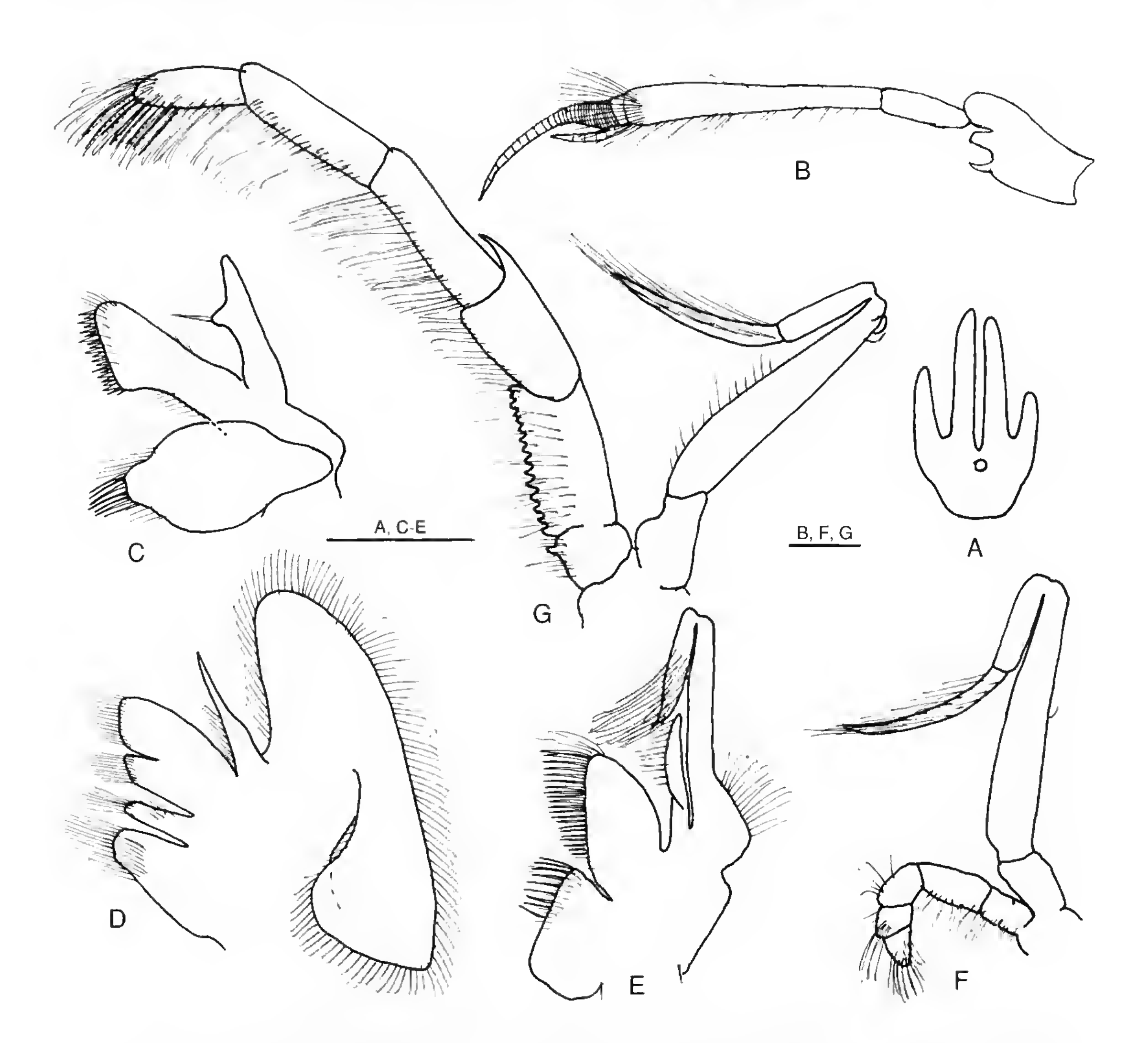


FIG. 2. — *Jacquesia polymorpha* n.sp., ♂ paratype, 4.9 mm (MNHN Pg 5656); **A**, gill lamella from distal portion of arthrobranch of seventh thoracic somite; **B**, left antennule (dorsal view, aesthetasks omitted); **C**, left maxillule (external view); **D**, left maxilla (external view); **E**, left first maxilliped (external view); **F**, left second maxilliped (external view); **G**, left third maxilliped (external view). Scale bars: A, 0.5 mm; B-G, 1.0 mm.

Ocular peduncles (including corneas) approximately 0.65-0.95 shield length; moderately slender basally, broadened at bases of slightly dilated corneas; corneal diameter 0.38-0.57 length of peduncle. Ocular acicles narrowly and acutely triangular, with very prominent submarginal spine. Acicles widely separated by prominent, slightly concave interocular lobe.

Antennular peduncles (Figs 1A, 2B) when fully extended, overreaching distal margins of corneas by 0.50-0.90 length of ultimate segment. Ultimate segment usually with row of long setae adjacent to dorsodistal margin and longitudinal row of long setae on dorsolateral surface. Penultimate segment with few short setae. Basal segment with statocyst region expanded laterally and dorsoventrally flattened, with acute spine on dorsolateral margin. Antennal peduncles (Fig. 1A) overreaching distal margins of corneas by 0.25-0.50 length of ultimate segment. Fifth and fourth segments with numerous long setae dorsally and ventrally. Third segment unarmed. Second segment with latero-distal projection reaching from 0.25 of fourth peduncular segment to nearly distal margin, terminating in acute simple or bifid spine; dorso-mesial distal angle with prominent acute spine. First segment with usually small, sometimes prominent, simple or bifid spine dorsodistally above antennal gland orifice. Antennal acicle reaching nearly to distal margins or often reaching considerably beyond distal margins of corneas; terminating in acute spine and with long setae on mesial margin. Antennal flagella overreaching outstretched chelipeds, with one or two (one to two article length) every other article and one or two long (four to five article length) every eight to twenty-five articles.

Right cheliped (Fig. 1A) with chela varying from moderately long and stout to long and moderately slender (Tables 1, 2); dactyl and fixed finger often roundly or acutely triangular in dorsal view. Dactyl 0.65-1.5 length of palm, usually overlapped by fixed finger; cutting edge with one or two low broad calcareous teeth in proximal half, few very small calcareous teeth, sometimes nearly fused, distally; terminating in small corneous claw; dorsomesial margin with single or double row of short to long, conical acute or subacute spines, dorsal surface flattened or slightly convex, with long setae obscuring one to three irregular rows of small spines or spinules at least in proximal half; ventral and mesial surfaces also with tufts of long setae. Palm 0.75 to equal length of carpus; dorsomesial margin with single or irregularly double row of short to long, slender to moderately stout, often conical spines; dorsal surface flattened to slightly convex, with several irregular longitudinal rows of small spines and spinules, extending onto dorsolateral surface of fixed finger, dorsolateral margin with single or nearly double row of moderately strong conical spines, at least on distal portion of palm and decreasing in size toward tip of fixed finger; armature partially to entirely obscured by short and long simple setae; mesial, lateral and ventral surfaces all with numerous short transverse rows of long setae; dorsal surface of fixed finger also with numerous long setae; cutting edge with one or two large rather blunt and few to several small calcareous teeth, terminating in small corneous or calcareous claw. Carpus equal to or slightly longer than merus; dorsomesial margin with row of acute spines at least in distal half, strongest at dorsodistal angle, dorsal surface with scattered long setae, dorsolateral margin with single or irregular double row of spines, mesial and ventral surfaces with short transverse rows of long setae; lateral face frequently with few small spines dorsally at least partially obscured by long setae, ventrolateral margin with prominent spine distally. Merus with numerous long setae on dorsal margin and mesial and lateral faces; ventrolateral distal margin with two to five acute spines; blunt or subacute protuberance at ventromesial angle; ventral surface often with few small spines or spinules. Ischium with setae mesially and ventrally.

Left cheliped (Fig. 3B-D) often equaling, sometimes exceeding, right in length but less robust; chela often narrowly to roundly triangular in dorsal view. Dactyl 0.85-1.2 length of palm; cutting edge with row of very small corneous teeth, terminating in corneous claw; dorsal surface flattened or weakly convex, with one to three longitudinal rows of small to moderately large spines in proximal 0.35-0.75, partially to entirely

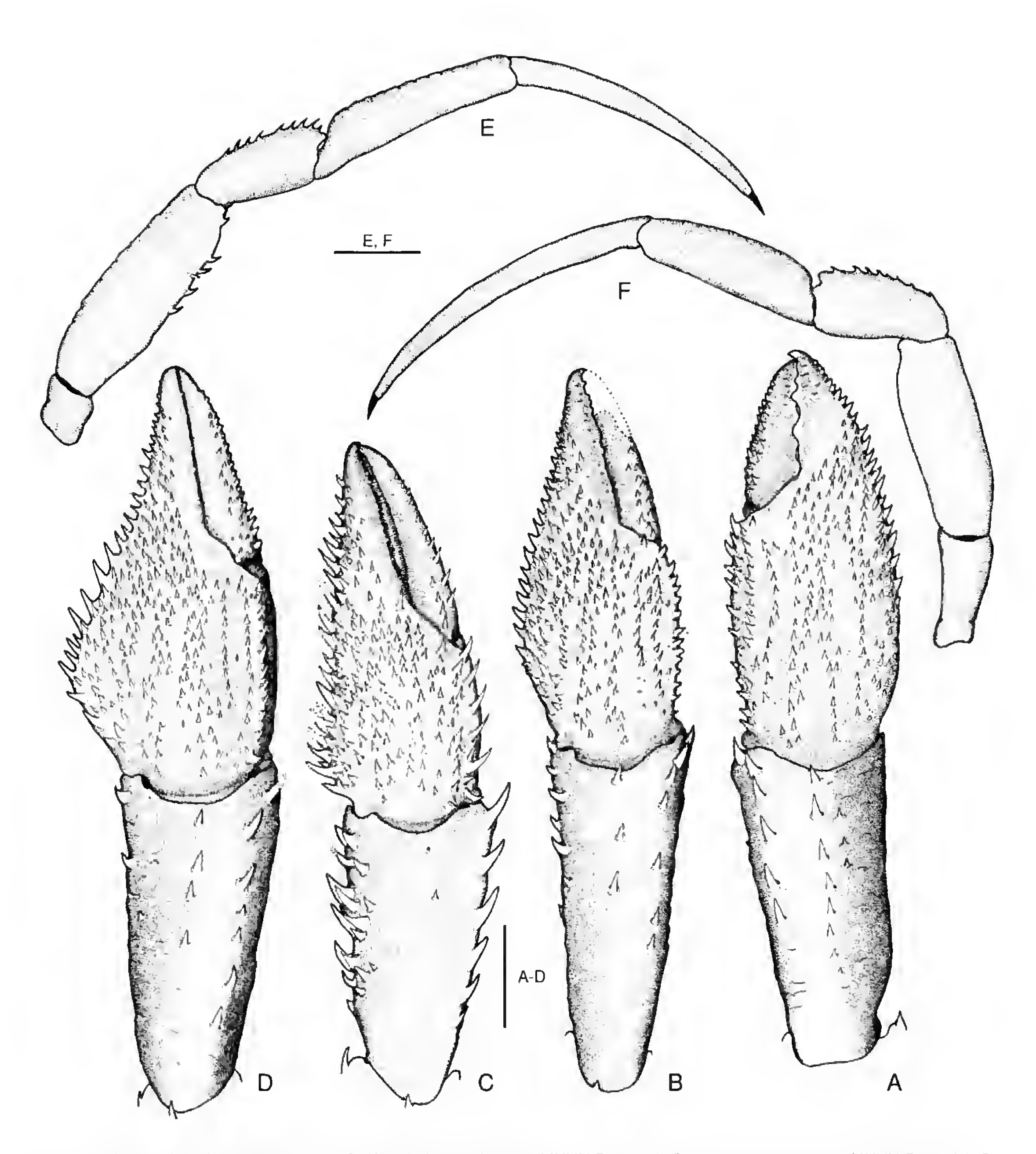


Fig. 3. — *Jacquesia polymorpha*, n.sp., A, B, E, F, holotype 5.0 mm (MNHN Pg 5655); C, ♂ paratype, 4.9 mm (MNHN Pg 5656); D, ♂, 3.7 mm (MNHN Pg 5668); **A**, carpus and chela of right cheliped (dorsal view, setae omitted); **B**-**D**, same of left cheliped; **E**, right second pereopod; **F**, left third pereopod (lateral view, setae omitted). Scale bars: 2 mm.

obscured by long setae; dorsomesial margin with row of short to moderately long spines decreasing in size distally and extending nearly to tip of fixed finger; mesial and ventral surfaces with tufts of long setae. Palm 0.65-0.80 length of carpus; dorsomesial and dorsolateral margins each with row of slender, short to quite long spines, dorsal surface flattened or with slightly elevated

rounded median plateau, surface with numerous irregular longitudinal rows of small spines and spinules extending at least onto proximal half of fixed finger, all partially to completely obscured by short and/or long setae; cutting edge of fixed finger with row of small calcareous teeth interspersed with small corneous teeth, terminating in small corneous claw; mesial, lateral and ventral surfaces also with numerous long setae. Carpus subtriangular, approximately as long to 0.35 longer than merus; dorsomesial margin with row of moderate to long acute spines at least in distal 0.65, usually second short row of smaller spines on sloping dorsolateral face, occasionally on one or two very small spinules; all partially obscured by long setae; mesial, lateral and ventral faces each with short transverse rows of long setae; somewhat rounded ventrolateral margin with irregular single or double row of spines, distalmost often extremely prominent, lateral face frequently with several smaller spines in ventral half. Merus with long setae on dorsal, lateral and ventral surfaces; dorsodistal margin with one spine; ventrolateral margin with two to five acute spines in distal half, ventromesial margin with one to three subacute spines near distal angle; ventral surface often with one to several small spines distally. Ischium with long setae on ventral margin.

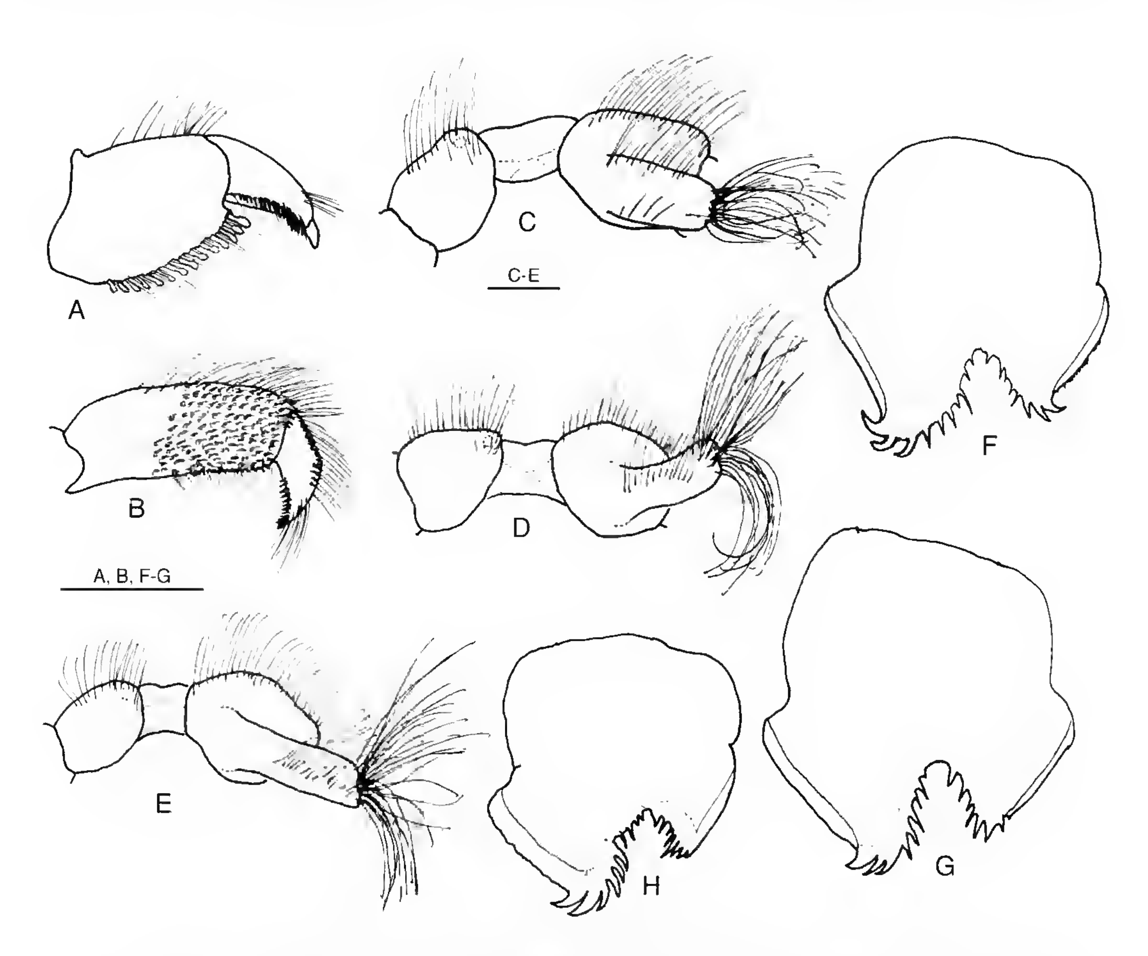


Fig. 4 — *Jacquesia polymorpha* n.sp., A, B, holotype, 5.0 mm (MNHN Pg 5655); C, F, ♂ paratype, 4.9 mm (MNHN Pg 5656); D, G, ♂, 4.7 mm; E, H, ♂, 3.7 mm (MNHN Pg 5675); **A**, dactyl and propodus of right fourth pereopod (lateral view); **B**, dactyl and propodus of right fifth pereopod (lateral view); **C-E**, sternite and coxae of last (eighth) thoracic sternite, showing left sexual tube and right gonopore (ventral view); **F-H**, telson. Scale bars: 1.0 mm.

Ambulatory legs (Figs 2B, 3E, F) similarly armed from left to right, but proportionally dissimilar. Dactyls of second right 1.0-1.4, third left 1.4-2.2 length of propodi; in dorsal view, straight; in lateral view, often somewhat curved ventrally; terminating in slender corneous claws; dorsal margins each with row of long bristle-like setae, mesial faces with covering of long stiff setae and dorsally accompanied by row of pinnate, spiniform setae in proximal half, mesial faces ventrally and/or ventromesial margins each with seven to ten shorter spiniform setae. Propodi of right second 1.4-2.2, propodi of third left 1.0-1.6 length of carpi; with long setae dorsally, arising from low protuberances, few scattered setae ventrally, ventrodistal margin with one or two spiniform setae mesially. Carpi each with row of five to twelve spines dorsal surface, but without spine at dorsodistal angle, spines of third pereopods usually smaller and sometimes fewer in number. Meri of second right pereopods longer and more slender than meri of third left; all with low protuberances and tufts of moderately long setae on dorsal margins; ventral margins of second pereopods each with two to five small spines or spinules in distal half; third unarmed. Ischia unarmed.

Sternite of third pereopods with small, subovate, roundly triangular, or subquadrate anterior lobe (Fig. 3C), un-armed or with one or two terminal spinules partially obscured by long setae. Fourth pereopods subchelate or very weakly semichelate. Coxae of fifth pereopods in males asymmetrical; left (Figs 2C-E, 3D) with thick, short to moderately long setose sexual tube directed posteriorly toward exterior.

Telson (Figs 1E, 4F-H) with posterior lobes slightly to moderately asymmetrical, each outer angle with one to three prominent, curved or hooked spines; terminal margins oblique, each with row of smaller acute spines.

Colour (in preservative)

Shield with splotches of orange, largest near posterior margin laterally. Ocular peduncles uniformly orange. Second segments of antennal peduncles opaque with orange distally. Chelipeds whitish, with orange band at mid-length of both dactyls and fixed fingers; palms orange on mesial faces at dorsodistal angles and in longitudinal streak on dorsal midline; carpi each with patch of orange distomesially and distolaterally, and one large orange spot proximally on mesial and lateral face; meri each with patch of orange on mesial and lateral faces at distal margins and one large orange spot on lateral face proximally.

Ambulatory legs whitish, each with three orange bands on dactyls, one distally, one in proximal half and one at proximal margin; propodi each with orange band at mid-length and orange spot on lateral face proximally; carpi each with patch of orange on distal margin mesially and laterally, patch of orange dorsally at mid-length on mesial face and spot in proximal half of lateral face ventrally; meri each with orange patch dorsodistally, two widely-separated orange spots on lateral face and additional orange spot on mesial faces of second pereopods. Ischia of third pereopods each with diffuse patch of orange laterally.

Reproduction

Females were ovigerous at shield lengths of 2.7-6.6 mm, and all carried numerous small eggs. The reproductive season appears to be quite prolonged, with egg-bearing females collected from August to March. Eggs were all in relatively early stages of development at the time of capture, with non-eyed eggs measuring from 0.62 to 0.82 mm in diameter.

Remarks

As its name implies, *Jacquesia polymorpha* is morphologically highly variable. These variations are most striking in the length of the male sexual tube and the shape of the left chela (Fig. 3B-D). The ten males from Vanuatu and the Chesterfield Islands had short sexual tubes (Figs 1D, 4C) and despite a size range of 2.6 to 5.0 mm (shield length), the sexual tube remained short, not reaching much if any beyond the coxal margin. These short sexual tubes appeared to arise more anteriorly on the coxa than the longer tubes, and as previously indicated, were pressed closely against the coxal surface. Among the thirty-four males with long sexual tubes, all from New Caledonia proper and the Kermadec Islands, shield lengths ranged from 2.0 to

TABLE 1. — Chelae width/length ratio in samples of *Jacquesia polymorpha* n.sp. with *short* male sexual tube (given as percent maximum width to length). **a. m.**, appendage missing.

Locality	Cruise/Station	Depth (m)	s.l. (mm)	Right chela		Left chela	
				♂	♀	♂	♀
Chesterfield	Mus. 5, CP 312	315-320	1.8	–	46	–	42
Chesterfield	Mus. 5, CP 312	315-320	2.8	–	42	–	38
Chesterfield	Mus. 5, CP 312	315-320	3.1	a. m.	–	40	–
Chesterfield	Mus. 5, CP 312	315-320	3.3	46	–	38	–
Vanuatu	Mus. 8, DW 1070	184-190	3.4	–	a. m.	–	38
Chesterfield	Mus. 5, CP 311	311	3.4	43	–	38	–
Chesterfield	Mus. 5, CP 318	330	3.5	43	–	39	–
Chesterfield	Chalcal 1, DC 61	250	3.6	42	–	32	–
Chesterfield	Chalcal 1, CP 17	295	3.7	40	–	39	–
Chesterfield	Mus. 5, CP 312	315-320	3.7	44	–	–	46
Chesterfield	Mus. 5, CP 312	315-320	3.8	–	43	–	42
Vanuatu	Mus. 8, DW 964	360-40	3.9	–	46	–	40
Chesterfield	Chalcal 1, DC 61	250	3.9	–	45	–	42
Chesterfield	Mus. 8, DW 963	400-440	4.0	–	44	–	46
Vanuatu	Mus. 5, CP 311	320	4.7	–	48	–	46
Chesterfield	Chalcal 1, DC 68	296	4.9	50	–	43	–
Vanuatu	Mus. 8, CP 1084	207-280	5.0	42	–	39	–
Average				*43.7*	*48.7*	*38.5*	*42.2*

TABLE 2. — Same data as Table 1 in samples of *Jacquesia polymorpha* n.sp. with *long* male sexual tube.

Locality	Cruise/Station	Depth (m)	s.l. (mm)	Right chela		Left chela	
				♂	♀	♂	♀
Chesterfield	Mus. 5, DW 361	400	2.2	47	–	50	–
N. Caledonia	Chalcal 2, DW 69	260	2.2	a. m.	–	40	–
N. Caledonia	Smib 4, DW 44	300	2.2	48	–	54	–
N. Caledonia	Smib 5, DW 87	370	2.3	44	–	51	–
N. Caledonia	Volsmar, DW 40	295	2.6	–	47	–	45
N. Caledonia	Mus. 4, DW 184	260	2.6	45	–	50	–
N. Caledonia	Smib 4, DW 46	260	2.9	–	48	–	49
N. Caledonia	Smib 5, DW 88	350	3.3	a. m.	–	56	–
N. Caledonia	Smib 5, DW 88	350	3.4	69	–	49	–
N. Caledonia	Smib 5, DW 88	350	3.5	–	50	–	54
N. Caledonia	Smib 4, DW 46	260	3.5	52	–	48	–
Chesterfield	Mus. 5, DW 378	355	3.6	43	–	47	–
N. Caledonia	Smib 5, DW 88	350	3.7	–	53	–	42
N. Caledonia	Mus. 4, DW 184	260	3.7	50	–	47	–
N. Caledonia	Mus. 4, DW 184	260	3.7	44	–	41	–
N. Caledonia	Smib 5, DW 88	350	4.2	46	–	49	–
N. Caledonia	Mus. 4, DW 184	260	4.5	64	–	–	–
N. Caledonia	Beryx 11, DW 18	250-270	4.5	55	–	50	–
N. Caledonia	Smib 4, DW 44	300	4.6	47	–	39	–
N. Caledonia	Smib 8, DW 165	372-660	4.7	42	–	41	–
N. Caledonia	Mus. 4, DW 184	260	4.8	a. m.	–	53	–
N. Caledonia	Volsmar, DW 40	295	4.9	50	–	46	–
Average				*48.7*	*49.5*	*48.7*	*47.5*

4.9 mm, and in all individuals the tube extended well beyond the distal coxal margin (Fig. 4D, E). The dorsal surfaces of the chelae are covered by long setae accompanied by dense short setae, both of which almost entirely obscured the surface armature. The left chela is relatively broad, roundly triangular in males of the first group. In the second group the setal covering of the chelae consisted principally of dense long setae; and the left chela was relatively narrow and triangular.

In both groups of males, the right gonopore is quite small, developed near the anteromesial margin of the coxa, and it is at least partially concealed by the surrounding setae.

As with chela shape, there was some variation in the occurrence of short setae. All specimens had an abundant covering of long setae, both marginally and on the surfaces; however, most frequently, but not exclusively, the broader the chela, the more common the presence of short setae as well.

Armature of the chelipeds and ambulatory legs similarly showed considerable variation, that did not appear correlated either with sex or size. While spines on the margins of both palms were often relatively short (Fig. 3A, B, D), they also could be extremely elongate, slender and curved (Fig. 3C). Armature of the carpi of the left chelipeds was even more variable. A row of spines of moderate to appreciable size was always present on the dorsomesial margin, but while usually extending well onto the proximal half, the spine row sometimes would not reach beyond midlength. Spines on the sloping dorsolateral margin in some specimens formed a well defined row, but in others were replaced by only one or two spinules. Similarly, the lateral faces of these carpi were unarmed in some specimens, had only a ventral marginal row of spines or could be strongly spinose over the entire ventral half of the surface. Spines on the carpi varied both in number and in strength on both the second and third pereopods.

The four specimens from the Philippines differed from all of the others in lacking the distinct row of long setae on the distal margin of the ultimate segment of the antennular peduncle. It did not appear that the setae had been lost during capture or as a result of preservation, as no row of setal pores could be detected under high magnification with light microscopy. There also appeared to be a slight difference in the density of the terminal setation of the male sexual tube; its length was generally intermediate between the long or short tubes observed in the other males. It is possible that these differences are indicative of a distinct Philippine subspecies; however, in view of the wide ranges of variation observed in other characters of *J. polymorpha* n.sp., we do not feel it prudent to propose a separate taxon for the Philippines specimens on the basis of four individuals.

DISCUSSION

We initially were of the opinion that two very similar species were represented in the collection. The first could be characterized in having short sexual tube that was not produced much beyond the distal margin of the coxa and was very closely applied against the coxa, giving the impression of partial fusion. Additionally, the setal covering of the chelae in this group consisted principally of dense long setae; the left chela was not narrow and triangular. The males of the second group each had a relatively long male sexual tube that extended well beyond the distal margin of the coxa, chelae with the dorsal surfaces covered by long setae accompanied by dense short setae, both of which almost entirely obscured the surface armature, and a relatively broad, roundly triangular left chela.

To test our hypothesis, we examined not only the length/width ratios of the left chela in the two groups, but also those of the right, and four other structures that are commonly conservative in pagurid species, looking for both inter-group differences and possible sexual dimorphism. Our sample sizes are too small for meaningful statistical analyses, but have provided the means for a substantive assessment.

As may be seen from Table 1 (first group), there was not an appreciable difference between the average ratios of either chela in males and females. In contrast, there was a suggestion of sexual dimorphism in the second group

TABLE 3. — Shield length/width; ocular peduncle/shield length ratios; percent overreach of antennular and antennal peduncles* in samples of *Jacquesia polymorpha*, new species, with *short* male sexual tube. *, percent ultimate antennular and/or antennal peduncular overreaches ocular peduncle (measured at distal corneal margin).

Cruise/Station	sl (mm)	Shield		Ocular peduncles		A1 peduncles		A2 peduncles	
		♂	♀	♂	♀	♂	♀	♂	♀
Mus. 5 CP312	1.8	–	93	–	89	–	60	–	24
Mus. 5 CP312	2.8	–	88	–	88	–	89	–	32
Mus. 5 CP312	3.1	93	–	74	–	90	–	26	–
Mus. 5 CP312	3.3	98	–	73	–	81	–	19	–
Mus. 8 DW1070	3.4	–	100	–	66	–	76	–	29
Mus. 5 CP311	3.4	82	–	90	–	78	–	17	–
Mus. 5 CP318	3.5	90	–	72	–	70	–	19	–
Chal. 1 DW 61	3.6	88	–	73	–	86	–	39	–
Chal.1 CP17	3.7	94	–	78	–	88	–	25	–
Mus. 5 CP312	3.7	–	98	–	74	–	73	–	27
Mus. 5 CP312	3.8	–	98	–	82	71	–	–	22
Mus. 8 DW964	3.9	–	100	–	92	–	88	–	33
Chalcal 1 DW61	3.9	–	96	–	71	–	80	–	32
Mus.8 DW963	4.0	–	102	–	70	–	116	–	33
Mus. 5 CP311	4.7	–	88	–	70	–	60	–	33
Chalc. 1 DW68	4.9	90	–	78	–	96	–	38	–
Mus. 8 CP1084	5.0	97	–	75	–	100	–	47	–
Average		*91.5*	*95.8*	*76.6*	*78.0*	*86.1*	*79.2*	*26.8*	*29.4*

TABLE 4. — Same data as Table 3 in samples of *Jacquesia polymorpha*, new species, with *long* male sexual tube.

Cruise/Station	sl (mm)	Shield		Ocular peduncles		A1 peduncles		A2 peduncles	
		♂	♀	♂	♀	♂	♀	♂	♀
Mus.5 DW361	2.2	92	–	92	–	53	–	15	–
Chal.2 DW69	2.2	97	–	94	–	56	–	19	–
Smib 4 DW44	2.2	97	–	82	–	79	–	26	–
Smib 4 DW87	2.3	97	–	92	–	56	–	30	–
Volsm. DW40	2.6	–	100	–	80	–	82	–	29
Mus. 4 DW184	2.6	83	–	91	–	94	–	38	–
Smib 4 DW46	2.9	–	85	–	85	–	80	26	–
Smib 5 DW88	3.3	96	–	71	–	86	–	50	–
Smib 5 DW88	3.4	93	–	88	–	–	80	–	26
Smib 5 DW88	3.5	–	96	–	84	–	87	–	28
Smib 4 DW46	3.5	80	–	80	–	89	–	27	–
Mus. 5 DW378	3.6	89	–	88	–	80	–	40	
Smib 5 DW88	3.7	–	100	–	72	–	94	–	42
Mus. 4 DW184	3.7	96	–	84	–	87	–	28	–
Mus. 4 DW184	3.7	–	93	–	68	–	62	–	42
Smib 5 DW88	4.2	101	–	84	–	81	–	24	–
Mus. 4 DW184	4.3	87	–	91	–	90	–	32	–
Ber. 11 DW18	4.5	94	–	89	–	50	–	17	–
Mus. 4 DW184	4.5	–	93	–	64	–	91	–	44
Smib 4 DW44	4.6	97	–	87	–	85	–	24	–
Smib 8 DW165	4.7	97	–	82	–	67		40	–
Mus. 4 DW184	4.8	–	90	–	88	–	95	–	52
Volsmar DW40	4.9	101	–	82	–	75	–	20	–
Average		*95.5*	*93.8*	*85.9*	*77.3*	*75.5*	*82.1*	*28.5*	*43.1*

(Table 2); males of this group tended to have noticeably narrower chelae. Although an average difference can be seen between the two groups, their ranges do overlap. In the four additional characters (Tables 3, 4), the average ratios of shield length to width were not appreciably different between the sexes in the first group, but longer shields were more common in females of the second group. When the ratios of shield length to ocular peduncular length were examined, the reverse was true. Differences in the average ratios between males and females of the first group were pronounced, but only slight in the second group. In the distance that both the antennular peduncles and antennal peduncles extended beyond the distal margins of the corneas (given as the ratio of extension to ocular peduncle length, in percent), females of the first group averaged appreciably greater extension than did males, whereas males averaged greater antennular peduncle extension in the second group and antennal peduncular extension was very similar between the sexes. Although averages of all ratios differed between the two groups, ranges overlapped. No definitive patterns could be detected that would support the hypothesis of two taxa represented.

We then looked at the bathymetric and geographic distributions of the two groups. As may be seen in Tables 1, 2 with only two exceptions, all specimens of the group characterized by a broad chela and long male sexual tube came from the New Caledonia area; specimens of the second group all were collected in the Chesterfield Islands and Vanuatu. The three specimens from the Kermadec Islands, while not included in our morphometric examination, are assignable to the first group. No differences in bathymetric distributions have been observed. Therefore, we have concluded that the morphological variation seen in *Jacquesia polymorpha*, new species, is more probably a function of geography and/or habitat than genetic difference. However, because our determination has been made on a relatively small sample, the possibility that two taxa really are involved cannot be totally ignored. For that reason, we have selected the holotype and paratypes exclusively from the group characterized by the short male sexual tube and narrow left chela.

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Trapeziid crabs (Crustacea, Brachyura, Xanthoidea, Trapeziidae) of the Indian Ocean and the Red Sea

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Crustacea,
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Trapeziidae,
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Red Sea,
symbiosis.

ABSTRACT
Twenty-seven species belonging to five genera of the family Trapeziidae inhabit the Indian Ocean and the Red Sea. These are: *Hexagonalia brucei*, *Quadrella boopsis*, *Q. coronata*, *Q. maculosa*, *Q. reticulata*, *Q. serenei*, *Tetralia cavimana*, *T. cinctipes*, *T. fulva*, *T. nigrolineata*, *T. rubridactyla*, *T. vanninii*, *Tetraloides heterodactyla*, *Tetraloides nigrifrons*, *Trapezia cymodoce*, *Tr. digitalis*, *Tr. ferruginea*, *Tr. flavopunctata*, *Tr. formosa*, *Tr. guttata*, *Tr. lutea*, *Tr. punctipes*, *Tr. richtersi*, *Tr. rufopunctata*, *Tr. septata*, *Tr. speciosa*, *Tr. tigrina*. The taxonomic status of one of these species, *Quadrella serenei* Galil, 1986, is discussed and the species is redescribed. *Q. serenei* was initially referred to as *Q. cyrenae* Ward, 1942 but it is concluded that Ward used specimens of *Q. maculosa* Alcock, 1898 in its description; *Q. lewinsohni* Galil, 1986 is a subjective synonym of *Q. serenei*. Another species, *Trapezia punctipes* Castro, 1997, is a new record for the region.

MOTS CLÉS
Crustacea,
Brachyura,
Trapeziidae,
océan Indien,
mer Rouge,
symbiose.

RÉSUMÉ
Trapeziidae (Crustacea, Brachyura, Xanthoidea) de l'océan Indien et de la mer Rouge.
Vingt-sept espèces appartenant à cinq genres de la famille Trapeziidae vivent dans les eaux de l'océan Indien et de la mer Rouge. Il s'agit de : *Hexagonalia brucei*, *Quadrella boopsis*, *Q. coronata*, *Q. maculosa*, *Q. reticulata*, *Q. serenei*, *Tetralia cavimana*, *T. cinctipes*, *T. fulva*, *T. nigrolineata*, *T. rubridactyla*, *T. vanninii*, *Tetraloides heterodactyla*, *Tetraloides nigrifrons*, *Trapezia cymodoce*, *Tr. digitalis*, *Tr. ferruginea*, *Tr. flavopunctata*, *Tr. formosa*, *Tr. guttata*, *Tr. lutea*, *Tr. punctipes*, *Tr. richtersi*, *Tr. rufopunctata*, *Tr. septata*, *Tr. speciosa*, *Tr. tigrina*. La position taxonomique d'une espèce, *Quadrella serenei* Galil, 1986, est discutée et l'espèce est redécrite. *Q. serenei* a été initialement désignée comme *Q. cyrenae* Ward, 1942 mais on conclut que Ward a utilisé des spécimens de *Q. maculosa* Alcock, 1898 dans sa description ; *Q. lewinsohni* Galil, 1986 est un synonyme subjectif de *Q. serenei*. Une autre espèce, *Trapezia punctipes* Castro, 1997, est signalée dans la région pour la première fois.

INTRODUCTION

Although included by Serène (1984) in his monograph of the Xanthoidea of the western Indian Ocean and the Red Sea, the more recent revisions of the Trapeziidae by Galil (1985, 1986a, 1986b, 1986c, 1988a, 1988b), Galil & Clark (1988), Galil & Lewinsohn (1983, 1984, 1985) and Castro (1996, 1997a, 1997b, 1998b, 1999) have prompted a reexamination of material from the region, especially that examined by Serène himself. Several collections, particularly those at the Muséum national d'Histoire naturelle, Paris, as well as specimens examined live have served as the basis for this study. Not included here are six species that were included in the Trapeziidae by Serène (1984): *Calocarcinus africanus* Calman, 1909, *C. habei* Takeda, 1980, *Domecia glabra* Alcock, 1899, *D. hispida* Eydoux *et* Souleyet, 1842, *Jonesius triunguiculatus* (Borradaile, 1902) and *Palmyria palmyrensis* (Rathbun, 1923). Their position within the Xanthoidea needs to be reexamined.
References only list records for the area and should not be interpreted as complete synonymies. One exception is *Quadrella serenei* Galil, 1986, which is revised. Measurements are given as carapace width (cw) and carapace length from the median sulcus (cl). Geographic names follow their English spelling in the third (1993) edition of the *Times Atlas* (Times Books, London).

The specimens studied are deposited in institutions that are indicated in the text as follows:

BMNH	Natural History Museum (former British Museum [Natural History]), London, U.K.;
BPBM	Bernice P. Bishop Museum, Honolulu, Hawaii, USA;
CBM	Natural History Museum and Institute, Chiba, Japan;
LACM	Natural History Museum of Los Angeles County, Los Angeles, USA;
MHNR	Muséum d'Histoire naturelle, Saint-Denis, La Réunion, France;
NHS	Nanki High School, Tanabe, Japan;
MNHN	Muséum national d'Histoire naturelle, Paris, France;
RMNH	Nationaal Natuurhistorisch Museum (former Rijksmuseum van Natuurlijke Historie), Leiden, The Netherlands;
SAM	South African Museum, Cape Town, South Africa;
SMF	Forschungsinstitut Senckenberg, Frankfurt am Main, Germany;
USNM	National Museum of Natural History, Smithsonian Institution, Washington, D.C., USA;
WAM	Western Australian Museum, Perth, Australia;
YU	Department of Biology, York University, York, U.K.;
ZISP	Zoological Institute, St. Petersburg, Russia;
ZMMU	Zoological Museum, Moscow State University, Moscow, Russia;
ZRC	Zoological Reference Collection, National University of Singapore, Singapore.

LIST OF SPECIES

Hexagonalia brucei (Serène, 1973)

Quadrella boopsis Alcock, 1898
Quadrella coronata Dana, 1852
Quadrella maculosa Alcock, 1898
Quadrella reticulata Alcock, 1898
Quadrella serenei Galil, 1986

Tetralia cavimana Heller, 1861
Tetralia cinctipes Paulson, 1875
Tetralia fulva Serène, 1984
Tetralia nigrolineata Serène *et* Dat, 1984
Tetralia rubridactyla Garth, 1971
Tetralia vanninii Galil *et* Clark, 1988

Tetraloides heterodactyla (Heller, 1861)
Tetraloides nigrifrons (Dana, 1852)

Trapezia cymodoce (Herbst, 1801)
Trapezia digitalis Latreille, 1828
Trapezia ferruginea Latreille, 1828
Trapezia flavopunctata Eydoux *et* Souleyet, 1842
Trapezia formosa Smith, 1869
Trapezia guttata Rüppell, 1830
Trapezia lutea Castro, 1997
Trapezia punctipes Castro, 1997
Trapezia richtersi Galil *et* Lewinsohn, 1983
Trapezia rufopunctata (Herbst, 1799)
Trapezia septata Dana, 1852
Trapezia speciosa Dana, 1852
Trapezia tigrina Eydoux *et* Souleyet, 1847

SYSTEMATIC ACCOUNT

Family Trapeziidae Miers, 1886
Genus *Hexagonalia* Galil, 1986

Hexagonalia brucei (Serène, 1973)

Quadrella brucei Serène, 1973: 202, figs 3, 8, 17-19, pl. 2A-D (Kenya); 1984: 288, fig. 192, pl. 41B, C (Kenya).

Hexagonalia brucei – Galil 1986c: 276, figs 1, 2 (Kenya).

Material examined. — **Kenya.** "Manihine", cr. 331, 2°33'S - 40°54'E, 100 m, 11.X.1971, A. J. Bruce coll. : 1 ♀ (MNHN-B 8190); cr. 333, 10.XII.1971: 1 ♂ (MNHN-B 8189); 2°58.6'S - 40°45'E, 170 m, cr. 333, 8.XII.1971: 4 ♂♂, 1 ♀ (MNHN-B 8191); 2°33'S - 40°54'E, 100 m, cr. 334, 9.I.1972: 6 ♂♂, 3 ♀♀ (MNHN-B 8192).
Mozambique Straits. "Van Gog", 50-170 m, on gorgonian ?, 26.IV.1966, B. G. Ivanov coll.: 1 ♀ (ZMMU).

Distribution. — Only known from a stylasterid coral and what appears to be a gorgonian in the western Indian Ocean at depths of 50-170 m.

Genus *Quadrella* Dana, 1851

Quadrella boopsis Alcock, 1898

Quadrella boopsis Alcock, 1898: 227 (Bay of Bengal); 1899: pl. 38, fig. 1. – Serène 1975: 514, figs 5-12, pl. 2 (Madagascar); 1984: 287, fig. 191, pl. 41A (Madagascar). – Castro 1999 (Mozambique, Madagascar).

Quadrella bispinosa Borradaile, 1902: 266, fig. 58 (Maldives). – Barnard 1950: 819 (Mozambique). – Galil 1986c: 278, fig. 3A-D (Maldives).

Material examined. — **Mozambique.** Xai-Xai: 1 ♂ (SAM A10830).
Madagascar. Faux Cap region, 28.X.1958, A. Crosnier coll.: 2 ♂♂, 1 ♀ (MNHN-B 8188).

Distribution. — Symbiont of dendrophylliid corals from the southwestern Indian Ocean to the western Pacific Ocean (Japan to French Polynesia) at depths of 10-95 m (see Castro 1999).

Quadrella coronata Dana, 1852

Quadrella coronata Dana, 1852a: 84. – Alcock 1898: 226 (northern Indian Ocean). – Borradaile 1902: 266 (Maldives). – Rathbun 1911: 235 (Seychelles). – Klunzinger 1913: 317 (Red Sea). – Barnard 1947: 365 (South Africa); 1950: 281, fig. 52e, f (South Africa). – Serène 1984: 289, fig. 195, pl. 41F (Madagascar). – Galil 1986c: 282, figs 3E, 4C-E (Seychelles, Maldives, Sri Lanka). – Kalk 1995: 228, fig. 8.10a (as *Trapezia cymodocea* [*sic*]) (Mozambique).

Quadrella coronata var. *granulosa* Borradaile, 1902: 266 (Maldives). – Laurie 1906: 411 (Sri Lanka).

Material examined. — **Red Sea.** "Ob", 50 m, 8.VI.1956: 1 ♂ (ZMMU).
Persian Gulf. Off Khor Fakkan, 25°21'N - 56°23'E, 24-28 m, on *Siphonogorgia* sp., 3-4.VII.1995, M. Apel coll.: 4 ♀♀ (SMF 24083).
Seychelles. Reves 2 Expedition, stn 21, 5°21.8'S - 56°10.4'E, 55 m, on gorgonian, 6.IX.1980: 1 ♂, 2 ♀♀ (MNHN-B 11622); stn 41, 4°43'S - 56°14.3'E, 53 m, on gorgonian, 13.IX.1980: 1 ♂, 1 ♀ (MNHN-B 11614); stn 44, 4°19.3'S - 56°11.9'E, 62 m, on gorgonian, 14.IX.1980: 2 ♂♂, 1 ♀ (MNHN-B 11615); stn 49, 3°54.4'S - 55°49.1'E, 57 m, on antipatharian, 15.IX.1980: 1 ♂ (MNHN-B 11623). — Northwest of D'Arros I., NIOP-E Tyro Expedition, stn 751, 5°24'S - 53°19'E, 56-59 m, on alcyonacean, 26.XII.1992; 2 ♂♂ (RMNH D 47202); stn 752, 5°24'S - 53°19'E, 45-55 m, on alcyonacean, 26.XII.1992: 3 ♂♂, 2 ♀♀ (RMNH D 47203); north of St. Joseph Atoll, stn 755, 5°23'S - 53°19'E, 50 m, on alcyonacean, 26.XII.1992: 4 ♂♂, 1 ♀ (RMNH D 47204); south of D'Arros I., stn 764, 5°29'S - 53°18'E, 50-55 m, 28.XII.1992; 1 ♂, 1 ♀ (RMNH D 47205); north of Poivre Atoll, stn 766, 5°44'S - 53°20'E, 43-48 m, 29.XII.1992: 1 ♂, 1 ♀ (RMNH D 47206); north of Poivre Atoll, stn 776, 5°42'S - 53°18'E, 42-45 m, 31.XII.1992: 1 ♂ (RMNH D 47207); west of Poivre Atoll, stn 778, 5°46'S - 53°11'E, 57 m, 1.I.1993: 1 ♀ (RMNH D 47208).
Comoro Is. Mayotte, Passe de Longogori, 40 m, on white gorgonian, April 1995, J. C. Martin coll.: 1 ♂ (MHNR-40).
Mozambique. "Algoa", 37°15'S - 18°30'E, 69 m, 17.VI.1994: 1 ♀ (SAM A41484).
South Africa. KwaZulu-Natal, W. H. Bell-Manley coll.: 1 ♀ (BMNH 1928.12.1.56). — KwaZulu-Natal, Port Durnford, "Meiring Naude", 29°00.9'S - 32°12.1'E, 200-220 m, 13.VI.1988: 1 ♂ (SAM A43254). — KwaZulu-Natal, off Sodwana Bay, "Sardinops", 31°8'S - 32°43'E, 70 m, on gorgonian, 2.VI.1990: 1 ♂ (SAM A43257), 1 ♀ (SAM A43258); Eastern Cape Province, off Lala Nek, 27°13.6'S - 32°14.3'E, 75 m, 8.VI.1990: 1 ♀ (SAM A43256); Eastern Cape Province, off Boteler Pt, 27°00.4'S - 32°55.2'E, 66 m, 6.VI.1990: 1 ♀ (SAM A43255). — KwaZulu-Natal, Durban, 1932: 1 ♂, 1 ♀ (SAM A7829). — Off Cape Agulhas, 50 m, 13-14.XII.1984, W. Litved coll.: 1 ♂, 1 ♀ (SAM A43253).
Madagascar. Nosy Bé, 5 m, 1971, P. Laboute coll.: 1 ♂ (MNHN-B 25239), 1 ♂, 1 ♀ (MNHN-B 25240), 1 ♂ (MNHN-B 25241).

Maldives. C. Anderson coll.: 1 ♀ (YU).

Distribution. — Symbiont of alcyonaceans, antipatharians and gorgonians from the Red Sea, Persian Gulf and western Indian Ocean to the western Pacific Ocean (Japan to the Coral Sea) at depths of 5-220 m.

Quadrella maculosa Alcock, 1898

Quadrella coronata var. *maculosa* Alcock, 1898: 226 (Andaman Is); 1899, pl. 38, fig. 2.

Quadrella maculosa – Rathbun 1911: 235 (part) (Seychelles, Cargados Carajos Is). – Garth 1971: 188 (Maldives). – Serène 1984: 288, fig. 194, pl. 41E (Kenya, Madagascar). – Galil & Takeda 1985: 203 (Seychelles). – Galil 1986c: 285, fig. 5C-F (Red Sea, Seychelles, Maldives, Sri Lanka); 1988b: 178, fig. 10 (Red Sea).

Quadrella cyrenae Ward 1942a: 45, pl. 3, figs 5, 6 (part) (Mauritius).

Material examined. — **Gulf of Aden.** "Meteor", MINDIK-Expedition, 12°31,2'N - 44°48,4'E, 76 m, 16.III.1987: 5 ♂♂, 3 ♀♀, 2 juv. (SMF 24084).
Kenya. 2°33'S - 40°54'E, 102 m, A. J. Bruce coll., 9.I.1972: 1 ♂ (MNHN-B 8198).
Seychelles. Reves 2 Expedition, stn 28, 4°48.1'S - 54°49.5'E, 50 m, 9.IX.1980: 1 ♀ (MNHN-B 11635); stn 34, 4°26.2'S - 54°53.0'E, 55 m, 10.IX.1980: 1 ♂, 1 ♀ (MNHN-B 11616); stn 35, 4°38.1'S - 54°52.1'E, 50-60 m, 10.IX.1980: 1 ♂, 1 ♀ (MNHN-B 11619); on antipatharian: 1 ♂, 1 ♀ (MNHN-B 11617); stn 49, 3°54.4'S - 55°49.1'E, 57 m, on antipatharian, 15.IX.1980: 1 ♂ (MNHN-B 11624); stn 58, 4°22.1 - 54°39.3'E, 60 m, 19.IX.1980: 1 ♀ (MNHN-B 11636); stn 60, 4°10.3'S - 55°11.8'E, 41-50 m, 19.IX.1980: 1 ♀ (MNHN-B 25721); stn 65, 58 m, 20.IX.1980: 1 ♂, 3 ♀♀ (MNHN-B 11637). — Northwest of D'Arros I., 5°24'S - 53°13'E, 56-59 m, on antipatharian, NIOP-E Tyro Expedition, stn 751, 26.XII.1992: 1 ♀ (RMNH D 47211); north of St. Joseph atoll, 5°23'S - 53°19'E, 50 m, on antipatharian, stn 755, 26.XII.1992: 1 ♂, 1 ♀ (RMNH D 47212); south of D'Arros I., 5°29'S - 53°18'E, 50-55 m, stn, 28.XII.1992: 1 ♂, 1 ♀ (RMNH D 47213).
Madagascar. Nosy Bé, 1971, P. Laboute coll.: 1 ♂, 1 ♀ (MNHN-B 25244), 6 ♂♂, 3 ♀♀ (MNHN-B 25246). — FAO 60, 22°08'S - 43°08'E, 115-135 m, 5.VI.1973: 1 ♂, 4 ♀♀ (MNHN-B 8196). — Tuléar, outer reef slope, 40-50 m, 18.VII.1971, B. Thomassin coll.: 1 ♂, 1 ♀ (MNHN-B 8197).
La Réunion. "Marion Dufresne", stn CP43, 73-77 m, 18.VIII.1982: 2 ♀♀ (MNHN-B 11621).

Distribution. — Symbiont of antipatharians from the Red Sea and the western Indian Ocean to the Pacific Ocean (Japan to French Polynesia) at depths of 40-135 m.

Quadrella reticulata Alcock, 1898

Quadrella coronata var. *reticulata* Alcock, 1898: 227 (Sri Lanka, Andaman Is).

Quadrella reticulata – Serène 1973: 199, figs 1, 7, 11-13, pl. 1 (Sri Lanka). – Galil 1988b: 179, fig. 11 (Red Sea).

Material examined. — **Sri Lanka.** Colombo: 1 feminized ♂, 2 ♀♀ (ZRC 1970.8.7.1-1).

Distribution. — Symbiont of antipatharians from the Red Sea to the western Pacific Ocean (Japan to Indonesia) at depths of 18-82 m (see Castro 1999).

Quadrella serenei Galil, 1986

Quadrella serenei Galil, 1986c: 289, fig. 8A, B (Seychelles, Madagascar, Cargados Carajos Is).

Quadrella maculosa – Rathbun 1911: 235 (part) (Cargados Carajos Is). – Serène 1973: 204 (part). – Galil & Takeda 1985: 203 (part). – Castro 1997a: 63, pl. 7B (part) (Vanuatu); 1997b: 111 (part) (French Polynesia).

? *Quadrella cyrenae* Ward, 1942a: 45 (part) (Mauritius); 1942b: 53 (part) (Mauritius, Cargados Carajos Is?). – Michel 1964: 30 (Mauritius). – Guinot 1967: 275 (list). – Serène 1968: 89 (list).

Quadrella cyrenae – Serène 1975: 510, figs 1-4, 13, pl. 1 (Madagascar, Mauritius, French Polynesia); 1977: 51 (Seychelles); 1984: 288, fig. 193, pl. 41D (Kenya, Madagascar).

Quadrella sp. – Monod 1979: 9, figs 1-8 (French Polynesia).

Quadrella lewinsohni Galil, 1986c: 285, figs 5A, B, 6 (Nicobar Is). – Poupin 1996: 57 (list). – Castro 1997b: 111 (French Polynesia).

Quadrella reticulata – Takeda & Marumura 1996: 7, pl. 1, figs 7, 8 (Japan).

Not *Quadrella cyrenae* Ward 1942a: pl. 3, figs 5, 6 (Mauritius) (= *Q. maculosa* Alcock, 1898).

Type material. — **Madagascar.** Fort Dauphin, 50 m, October 1958, A. Crosnier coll.: 1 ♂ holotype (cl 12.0 mm, cw 14.6 mm; MNHN-B 8193). — FAO 60, 22°08'S - 43°08'E, 115-135 m, 5.VI.1973: 1 ♀ paratype (cl 12.8 mm, cw 16.5 mm; MNHN-B 8195).

Material examined. — **Kenya.** 2°33'S - 40°54'E, 100 m, 10.XII.1971, A. J. Bruce coll.: 1 ♂ (MNHN-B

8194). — "Professor Mesyatsev", 19.XII.1975: 2 ♀♀ (ZMMU); 50 m, 4.IV.1976: 1 ♀ (ZMMU Ma 4436).
Seychelles. Reves 2 Expedition, stn 17, 5°44.8'S - 56°39.1'E, 55 m, on antipatharian, 5.IX.1980: 1 ♀ (MNHN-B 26138); stn 31, 4°41.9'S - 54°36.7'E, 50 m, on antipatharian, 9.IX.1980: 1 ♂, 1 ♀ (MNHN-B 11632); stn 35, 4°38.1'S - 54°52.1'E, 50-60 m, on antipatharian, 10.IX.1980: 2 ♀♀ (MNHN-B 26137); stn 41, 4°43'S - 56°14.3'E, 50 m, 13.IX.1980: 1 ♀ (MNHN-B 11633); stn 53, 3°48.3'S - 55°20.7'E, 64 m, 17.IX.1980: 1 ♂ (MNHN-B 11634). — West of Aride I., 4°13'S - 55°34'E, 47 m, on antipatharian, NIOP-E Tyro Expedition, stn 702, 17.XII.1992: 1 ♀ (RMNH D 47209); north of Bird I., 3°42'S - 55°12'E, 55-63 m, on antipatharian, stn 730, 22.XII.1992: 2 ♂♂, 3 ♀♀ (RMNH D 47210); northwest of D'Arros I., 5°24'S - 53°31'E, 56-59 m, on antipatharian, stn 751, 26.XII.1992: 1 ♀ (RMNH); south of D'Arros I., 5°29'S - 53°18'E, 50-55 m, stn 764, 28.XII.1992: 1 ♂, 3 ♀♀ (RMNH); west of Poivre atoll, 5°46'S - 53°11'E, 57 m, stn 778, 1.I.1993: 1 ♀ (RMNH D 47214).
Madagascar. Nosy Bé, 1971, P. Laboute coll.: 1 ♀ (MNHN-B 25242), 1 ♂, 1 ♀, 3 juv., 1 first crab stage (MNHN-B 25243); 35 m, 10.IX.1970: 2 ♂♂, 1 ♀ (MNHN-B 25245). — 25°09'S - 47°14.2'E, 80-85 m, 3.III.1973, A. Crosnier coll.: 1 ♀ (MNHN-B 16476).
La Réunion. "Marion Dufresne", stn CP43, on antipatharian, M. de Saint Laurent coll.: 2 ♀♀, prezoeas (MNHN-B 26136).
Cargados Carajos Is. Percy Sladen Trust Expedition, 90 m, 1.IX.1905: 1 ♀ (USNM 41344).
Chagos Archipelago. Île Vache Marine, G. B. Reinicke coll., 3.III.1996: 1 ♂ (RMNH D 46883); Great Chagos Bank, Nelson I., 12.III.1996: 1 ♀ (RMNH D 46882); 13.III.1996: 1 ♂, 1 ♀ (RMNH D 46881).
Nicobar Is. Tillanchang I., I. Eibl-Eibesfeldt coll.: 1 ♂ holotype of *Q. lewinsohni* Galil (cl 8.7 mm, cw 10.7 mm; SMF 9891), 1 ♀ allotype of *Q. lewinsohni* (cl 13.4 mm, cw 10.6 mm; SMF 23851), 4 ♀♀ paratypes of *Q. lewinsohni* (cl 7.2-10.1 mm, cw 9.0-12.7 mm; SMF 23852).
Japan. Kii Peninsula, off Shirahama, 40-50 m, on *Antipathes* sp., 21.X.1997, M. Marumura coll.: 1 ♂, 1 ♀ (NHS).
Vanuatu. MUSORSTOM 8, stn DW988, 19°16.04'S - 169°24.12'E, 372-466 m, 20.IX.1994: 1 juv. ♀ (MNHN-B 25766).
French Polynesia. Marquesas Is, Tahuata I., 10-15 m, on antipatharian, M. Denizot coll.: 1 ♂, 2 ♀♀ (MNHN-B 20411). — Marquesas Is, Tahuata I., J. Haywood coll., 24.IV.1971: 1 ♂, 1 ♀ (BPBM S11782). — Marquesas Is, Fatu Hiva, 10°29.0'S - 138°40.18'W, 49 m, 29.I.1991, J. Poupin coll.: 2 ♂♂, 1 ♀ (MNHN-B 26139). — Marquesas Is, Eiao I., 100 m, MUSORSTOM 9, stn CP 1157, 23.VIII.1997: 1 ♂, 1 ♀ (MNHN-B 26199), 1 juv. ♀ (MNHN-B 26197). — Marquesas Is, Nuku Hiva I., 104-109 m, MUSORSTOM 9, stn 1170, 25.VIII.1997: 1 ♂, 1 ♀ (MNHN-B 26200); 108-112 m, stn CP 1177, 25.VIII.1997: 2 ♂♂, 1 ♀ (MNHN-B 26196); 75 m, stn CP 1178: 1 ♂, 2 ♀♀, 2 juv. (MNHN-B 26198).
Unknown locations. "Vitiaz", cr. 17, stn 2803, 87-100 m, 7.I.1989: 3 ♂♂, 5 ♀♀ (ZMMU). — On antipatharians: 2 ♀♀ (SMF).

DISTRIBUTION. — Symbiont of antipatharians from the western Indian Ocean, Japan, Vanuatu (southwestern Pacific) and French Polynesia at depths of 10-466 m.

COLOUR. — A female from the Seychelles (RMNH D 47209) photographed live had brownish-gray carapace and blue-gray chelipeds and legs. The cheliped articulations and fingers were purple-pink; the eyes and dactylus and distal portion of the propodus of walking legs were yellow. Small specimens photographed before preservation in Japan (Takeda & Marumura 1996: pl. 1, figs 7, 8; as *Q. reticulata*) and Vanuatu, southwestern Pacific (Castro 1997a: pl. 7B; as *Q. maculosa*) had a pattern of purple lines on a light purple background. The purple lines formed a thin "M" across the anterior half of the carapace and a triangle on the posterior half. Thin, sinuous purple lines crossed the chelipeds. The distal portion of the merus and propodus of the walking legs were dark purple.

DISCUSSION

Ward (1942a) described *Q. cyrenae* from specimens collected in Mauritius. Ward's description and the identity of the holotype, however, are puzzling. Some of the characters given in the description (cheliped carpus "armed with two spines" and "sharp forwardly directed spine" on each side of the carapace; Ward 1942a: 45) and characters shown in two photographs (one anterior spine visible on each cheliped carpus, no visible thoracic suture; Ward 1942a: pl. 3, figs 5, 6) are diagnostic for *Q. maculosa*, a close species that is also found through the western Indian Ocean (see above). The presence on the cheliped merus of "about ten fine curved spines which become larger distally", however, is a character found only in juveniles and small adults of both *Q. cyrenae* and *Q. maculosa*. Although Ward may have based his description on a small specimen, the size of the holotype ("9 mm in maximum carapace width") is that of an adult. Of the seven

specimens of *Q. cyrenae* of a similar size (cw 9.0-10.4 mm) that were examined (MNHN-B 11632, 11634, 16476, 20411; BPBM), four had only rounded tubercles and three had two distal teeth on the cheliped merus, not the "ten fine curved spines" of Ward's description. Such ambiguities were pointed out by Serène (1975), who had initially made *Q. cyrenae* a junior synonym of *Q. maculosa* (Serène 1973). Serène examined a male specimen sent by the Mauritius Institute, presumably the holotype of *Q. cyrenae* although not labelled as such. The specimen did not agree with Ward's description but Serène recognized this and five other specimens he had examined (MNHN-B 8193, 20411 and one lost specimen) as belonging to a species different from *Q. maculosa* or any described species of *Quadrella*. Serène nevertheless opted to refer to it as *Q. cyrenae*, even though he questioned the authenticity of Ward's presumed holotype.

Barnard (1950: 281) suggested that *Q. cyrenae* was "probably to be regarded as a variety" of *Q. coronata* Dana, possibly based on the curved spines described on the cheliped merus by Ward (1942a). Galil & Takeda (1985) concluded instead that *Q. cyrenae* was a junior synonym of *Q. maculosa*, but Galil (1986) divided specimens previously identified as *Q. cyrenae* by Serène (1975) (as well as additional material) and described two new species: *Q. lewinsohni* Galil, 1986, and *Q. serenei* Galil, 1986.

The two species were differentiated by:

1) a narrower, V-shaped indentation between the two median lobes of the anterior carapace border in *Q. serenei* (wider and U-shaped in *Q. lewinsohni*);

2) a more prominent supraorbital angle in *Q. serenei*;

3) non-protuberant eyes in *Q. serenei* ("cornea extending beyond postorbital angle" in *Q. lewinsohni*);

4) "raised tubercles anteriorly, successively larger and more acuminate distally" in *Q. serenei* ("minute tuberculation" on the cheliped merus of *Q. lewinsohni*) (Galil 1986: 291).

Examination of extensive material (including most specimens seen by Serène and Galil) that varied in size from first crab stage to large individuals (female, cl 13.2 mm, cw 16.5 mm; ZMMU) shows that *Q. serenei* and *Q. lewinsohni* are conspecific. The shape of the indentation between the median lobes of the anterior border of the carapace is clearly, as in other species of *Quadrella*, a highly variable character. It is mostly, although not exclusively, correlated with size. It is V-shaped in the smallest individuals, intermediate in some of the larger ones (female, cl 10.5 mm, cw 13.4 mm; ZMMU) and mostly, but not always, U-shaped in the largest individuals (Serène 1975: pl. 1B'; Galil 1986: fig. 5A). It is U-shaped, however, in the holotype of *Q. serenei* (Serène 1975: pl. 1B; 1984: pl. 41D; Galil 1986: fig. 8A). Large specimens of a similar size and same sex that were collected together varied in the shape of their indentation. The relative size of the supraorbital angle and of the eyes, which were also used to distinguish between the two species, are also variable characters influenced by the size and the position of the eyes when the specimen was preserved. One specimen (female, cl 7.2 mm, cw 9.0 mm; SMF 9891) had a bulging left eye but a non-bulging right eye. A similar situation is observed in the figure given by Galil (1986: fig. 5A) for a paratype specimen of the same SMF material. The ornamentation of the cheliped merus shows enormous variation, from spine-like teeth in the smallest juveniles (MNHN-B 25243, 25245; ZMMU) to various arrangements of small tubercles in the largest individuals (see below). Other differences deduced from the descriptions by Galil (1986: 285, 290), such as the number of teeth on the dactylus of the fourth pair of walking legs (fifteen in *Q. lewinsohni*, fourteen in *Q. serenei*) fall, as in the other characters, within the normal variation of a species.

It is thus concluded that:

1) it appears that Ward (1942) used specimens of *Q. maculosa* in his description of *Q. cyrenae*;

2) Serène (1975) retained the name *Q. cyrenae* for a Mauritius specimen that did not fit Ward's description as well as additional material that correctly showed to be different from *Q. maculosa*, even though he questioned the validity of the holotype and Ward's description;

3) the two species established by Galil (1986), *Q. lewinsohni* and *Q. serenei*, as well as the species referred to as *Q. cyrenae* by Serène, belong to a

single species that can be distinguished from *Q. maculosa* and the other species of *Quadrella*.
The fate of Ward's holotype is unfortunately unknown. Michel (1964) does not indicate the presence of a holotype at the Mauritius Institute. Two specimens of *Q. cyrenae* Ward were listed, one from Mauritius and one "without data." A specimen currently present at the Institute is labelled as *Q. cyrenae* but not as its type (D. Guinot, personal communication). The type material designated by Galil (1986: 285) for *Q. lewinsohni* (SMF 9891, 23851, 23852) is unfortunately in poor condition and all the appendages, except a cheliped in one paratype specimen, are dismembered. The holotype (MNHN-B 8193; Serène 1975: figs 2, 13, pl. 1A-E; 1984: fig. 193, pl. 41D [both as *Q. cyrenae*]; Galil 1986: fig. 8A) and paratype (MNHN-B 8195) that were designated by Galil (1986: 289) for *Q. serenei* are, however, in excellent condition.
The desciption of *Q. serenei* by Galil (1986) is accurate except some characters that pertained to its separation from *Q. lewinsohni*, now regarded as a subjective junior synonym. These characters fall within the range of variation of the species. Under the 1985 International Code for Zoological Nomenclature, if two species are described simultaneously, the first reviewer chooses the valid one. The original description is therefore revised and expanded to incorporate this variation as well as new characters.

Redescription and morphological variation

Carapace globose, constricted behind postorbital angle (Serène 1975: pl. 1A, B; 1984: pl. 41D; Galil 1986: figs 5A, 8A). Anterolateral borders inflated. Epibranchial teeth acute in juveniles and small adults, progressively smaller and tuberculate with increasing size of individuals. Acute intermediate tooth halfway between postorbital and epibranchial teeth in juveniles. Posterolateral margins arched. Frontal lobes triangular and acute; median sulcus deeper than submedian indentation, narrow and V-shaped in juveniles and small adults, often but not always progressively wider and U-shaped with increasing size. Lateral lobes separated from submedian lobes by smaller, oblique or U-shaped sulcus and not extending as far forward as submedian lobes, except in smallest juveniles, which are equal in size. Supraorbital angle distally acute in juveniles and small adults, progressively tuberculate with increasing size of individuals. Postorbital tooth long, acute and directed outward. Inner suborbital tooth acute, almost as prominent as lateral frontal lobes. Eyes protuberant, relatively less so in largest individuals.
Conspicuous and complete suture (sternal suture 2/3) between second and third thoracic sternites. Interantennular septum triangular with rounded anterior border. Anterior edge of buccal frame sinuous, imperceptibly notched medially; notched edges at termination of exhalant canals. Exognath of third maxillipeds medially constricted, tooth at anterior margin rounded, less so in smallest juveniles. Ischium of endognath subrectangular, posterior half of inner margin with minute tubercles; merus with distal outer angle extended, distal inner angle obliquely cut, inner margin rounded.
Chelipeds massive and about equal (Serène 1975: pl. 1A, C, D; 1984: pl. 41D; Galil 1986: figs 5A, 8A). Anterior edge of ischium with several rounded tubercles. Merus subcylindrical, almost as long as carapace; ten to eleven acute teeth along anterior border in smallest juveniles, decreasing in number and length with size of individuals, until six to seventeen short, minute or rounded to sharp tubercles (larger and more pointed distally) in larger individuals. Carpus rounded, armed with two acute teeth on inner margin in smallest juveniles, decreasing in length and becoming tuberculate with increasing size of individuals; absent in largest. Dactylus and finger slender to slightly swollen, particularly in males.
First walking leg about twice as long as carapace. Propodus longer than dactylus, with twelve to twenty cornute spines on posterior margin. Dactylus with thirteen to sixteen triangular teeth that decrease in size proximally and row of thirteen to seventeen cornute spines; on anterior border irregular rows of short setae; on distal end acute, curved and cornute tooth. Propodus of fourth walking leg slightly longer than dactylus, with ten to sixteen cornute spines on posterior margin. Dactylus (Serène 1975: pl. 1E, E'; Galil

1986: figs 5B, 8B) with thirteen to sixteen triangular teeth that decrease in size proximally and row of twelve to sixteen cornute spines; on distal end acute, curved and cornute tooth.
First male pleopod straight, tapered; short subdistal spinules (Serène 1975: figs 1-4; 1984: fig. 193; Galil 1986: fig. 6).

ADDITIONAL REMARKS
Adult *Q. serenei* can be differentiated from adult *Q. maculosa* (Serène 1973: pl. 3; 1984: pl. 41E; Galil 1986: fig. 5C-F), a close species, by the presence of a clear and complete sternal suture (absent in *Q. maculosa*), more slender chelipeds (thicker chelipeds and fingers, particularly in males, in *Q. maculosa*), smooth to slightly tuberculated lower margin of the cheliped propodus (tuberculated in *Q. maculosa*), very few or no setae on the outer margin of propodus of cheliped (many setae, some plumose, in *Q. maculosa*), wider and shallower median sulcus on the anterior border of the carapace, tuberculate epibranchial teeth in larger individuals (acute, prominent and directed upward in *Q. maculosa*), a cheliped merus that is unarmed or has several rounded to pointed tubercles along the anterior border (at least one or two acute distal teeth in *Q. maculosa*), sparse setae on the propodus and dactylus of the walking legs (many long setae in *Q. maculosa*) and a male pleopod that has short subdistal spinules (thicker and longer subdistal spinules in *Q. maculosa*; Serène 1973: figs 20-22; 1984: fig. 194). Preserved specimens of *Q. serenei* rarely show any hints of colour, whereas pigment is almost always observed on the carapace, walking legs and abdomen of *Q. maculosa* (Serène 1984: pl. 41E).
Juveniles and small adults of both species are similar and most of the characters used in the adults do not apply. The most reliable characters are the absence of abundant setae on the cheliped propodus and the presence of a sternal suture in *Q. serenei*. A suture was observed in only two small females of *Q. maculosa* (cl 2.8 mm, cw 3.5 mm, MNHN-B 25244; cl 3.8 mm, cw 4.9 mm, MNHN-B 11637). In small adults (cw around 4.0-9.0 mm) of *Q. serenei*, the epibranchial spines and the spines on the cheliped merus and carpus become tuberculated and those on the cheliped carpus decrease in number much faster with increasing size than in *Q. maculosa*. An intermediate epibranchial spine on one or both sides was found in small specimens of both species.
This reappraisal of *Q. serenei* completes the revision of *Quadrella*, which now comprises six species: *Q. boopsis* Alcock, 1898 (see Castro 1999), *Q. coronata*, *Q. maculosa*, *Q. nitida* Smith, 1869, *Q. reticulata* (see Castro 1999) and *Q. serenei*.

Genus *Tetralia* Dana, 1851

All six known species of *Tetralia* are symbionts of reef corals (*Acropora*). Most species (as well as two others now placed under *Tetraloides* Galil, 1986) were grouped together as one species, *T. glaberrima* (Herbst, 1790) before a revision by Galil (1986a, 1986b, 1988a). The holotype of *T. glaberrima*, however, appears to be lost and thus the identity of the type species of the genus remains unknown. The identities of only a few of the Indian Ocean and Red Sea records of *T. glaberrima* have been determined after the examination of specimens or from colour descriptions. Still unidentified are records of Krauss (1843: South Africa), Hilgendorf (1879: Mozambique), Ortmann (1894: Tanzania), Borradaile (1902: Maldives), Doflein (1904: Seychelles), Laurie (1906: Sri Lanka), Calman (1909: Christmas I.), Lenz (1910: Europa I.), Stebbing (1910: South Africa), Chopra & Das (1937: Arabian Sea, Bay of Bengal, Andaman Sea), Vatova (1943: Somalia), Stella (1953: Red Sea), Fourmanoir (1954: Madagascar), Sankarankutty (1961: Laccadive Is; 1962: Andaman Is; 1966a: India; 1966b: Seychelles, Mauritius, Maldives), Michel (1964: Mauritius), Garth (1974: Maldives, Sri Lanka), Lundoer (1974: Andaman Sea), Serène (1977: Seychelles), Tsareva (1980: Western Australia) and Garth (1984: Seychelles).

Tetralia cavimana Heller, 1861

Tetralia cavimana Heller, 1861a: 14 (Red Sea); 1861b: 353, pl. 3, figs 24, 25 (Red Sea). – Paulson 1875: 57, pl. 7, figs 7, 7a; pl. 9, fig. 1a-d (part) (Red Sea). – Kossmann 1877: 44 (Red Sea). – De Man 1880: 180 (Red Sea); 1881: 94 (Red Sea). – Miers 1884b: 537 (part) (Red Sea). – Galil 1988a: 59, figs 1a, 2a, b (Red

Sea, Gulf of Aden, Persian Gulf); 1988b: 170, fig. 6 (Red Sea, Gulf of Aden). – Hogarth 1994: 103 (Oman).

Tetralia glaberrima – Nobili 1906a: 143 (Persian Gulf); 1906b: 294 (Red Sea, Gulf of Aden). – Klunzinger 1913: 314 (Red Sea). – Balss 1924: 13 (Red Sea). – Monod 1938: 142 (Red Sea).

? *Tetralia glaberrima* – Nobili 1901: 16 (Red Sea). – Laurie 1915: 415, 463 (Red Sea). – Pesta 1928: 72 (Red Sea). – Gurney 1938: 77, pl. 2, figs 29-33 (Red Sea). – Ramadan 1936: 35 (Red Sea). – Stephensen 1945: 161, fig. 42C, D (Persian Gulf). – Hogarth 1989: 106 (Oman).

MATERIAL EXAMINED. — **Red Sea.** 1897, F. Jousseaume coll.: 12 ♂♂, 3 ♀♀ (MNHN-B 8544). — Gulf of Suez, 29.XII.1928, R. Dollfus coll.: 2 ♂♂ (MNHN-B 13937), 2 ♀♀ (MNHN-B 13940). — Abu Lat I., "Calypso", 1952: 1 ♂, 3 ♀♀ (MNHN-B 13936), 1 ♀ (MNHN-B 13939); Marmar, 19.I.1952: 1 ♂ (MNHN-B 13942).
Gulf of Aden. Obock, 1893, M. Maindron coll.: 1 ♀ (MNHN-B 8539), 1 ♂ (MNHN-B 8538). — Musha I., 21.I.1904, C. Gravier coll.: 1 ♂ (MNHN-B 8537). — "Odissey", st. 34, 13°59.5'N - 48°24.7'E, 3-5 m, 23.IV.1985: 2 ♂♂, 1 ♀ (ZMMU Ma-4480).
Socotra. 1 ♂, 1 ♀ (YU).
Persian Gulf. Arzanah I., stn 53, 1901, J. Bonnier & C. Pérez coll.: 8 ♂♂, 10 ♀♀ (MNHN-B 11683), 2 ♂♂, 2 ♀♀ (MNHN-B 13941), 42 ♂♂, 48 ♀♀ (MNHN-B 16784), 17 ♂♂, 21 ♀♀ (MNHN-B 25375). — Juraid I., 27°11'48"N - 49°57'24"E, 14.X.1956, C. E. Dawson coll.: 1 ♂ (USNM 101921).
Kenya. Kilifi Creek, XII.1985, W. Baumeister coll.: 1 ♀ (SMF 17753).

DISTRIBUTION. — Only recorded from the Red Sea, Persian Gulf and the western Indian Ocean as far south as Kenya.

Tetralia cinctipes Paulson, 1875

Tetralia cavimana var. *cinctipes* Paulson, 1875: 60, pl. 7, fig. 8 (Red Sea).

Tetralia heterodactyla – Heller 1861a: 14 (part) (Red Sea); 1861b: 353 (part) (Red Sea). Not *Tetraloides heterodactyla* (Heller, 1861).

Tetralia glaberrima – Alcock 1898: 223 (part) (northeastern Indian Ocean). – Borradaile 1902: 265 (part) (Maldives). – Klunzinger 1913: 314 (part) (Red Sea).

Trapezia digitalis forme *typica* – Bouvier 1915: 273 (part) (Mauritius). Not *T. digitalis* Latreille, 1828.

Tetralia glaberrima pullidactyla – Garth 1971: 185 (Maldives). – Serène 1984: 282, pl. 40C (Mozambique Channel, La Réunion).

Tetralia cinctipes – Galil 1986b: 97, figs 1-3 (Red Sea, Seychelles); 1988b: 171, fig. 7 (Red Sea). – Galil & Clark 1988: 138, figs 1A, 3A, 4A, 4F, 5A, 6A (Somalia, Kenya). – Castro 1997a: 64 (Madagascar, La Réunion).

MATERIAL EXAMINED. — **Seychelles.** Remire Reef, 12.II.1972, A. J. Bruce coll.: 2 ♂♂, 1 ♀ (MNHN-B 13344). — Mahé, North East Point, NIOP-E Tyro Expedition, stn 604, 4°35'S - 55°28'E, reef flat and slope to 5 m, 8.XII.1992, C. Fransen coll.: 1 ♂ (RMNH D 47215); La Digue I., stn 735, 4°23'S - 55°50'E, 10 m, plate *Acropora*, 23.XII.1992: 4 ♂♂, 1 ♀ (RMNH D 47216); St. Joseph Atoll, stn 759, 5°27'S - 53°21'E, 10 m, 28.XII.1992: 1 ♂, 1 ♀ (RMNH D 47217).
Comoro Is. Mayotte, 1901, Humboldt coll.: 2 ♂♂ (MNHN-B 13907).
Madagascar. Banc de Geyser, March 1972, A. J. Bruce coll.: 1 ♂, 1 ♀ (MNHN-B 25376); Banc de la Zélée, 1 ♂, 1 ♀ (MNHN-B 8169).
La Réunion. S. Ribes coll.: 1 ♂, 1 ♀ (MNHN-B 8168); 4 ♂♂, 3 ♀♀ (MNHN-B 16087); 30.VII.1977: 1 ♂, 1 ♀ (MNHN-B 14044). — Saint Gilles, reef flat, 17.IX.1982, M. de Saint Laurent coll.: 1 ♂ (MHNR-B 33). — La Saline, reef flat, 1 m, *Acropora humilis*, 7.IX.1996, P. Castro & S. Ribes coll.: 1 ♂, 1 ♀ (MHNR-B 34), *A. abrotanoides*: 1 ♂, 1 ♀ (MHNR-B 35); *A. humilis*, 9.IX.1996: 1 ♂, 1 ♀ (MHNR-B 41); outer reef slope, 20 m, *A. humilis*, 8.IX.1996: 1 ♂, 1 ♀ (MHNR-B 36), *A. abrotanoides*: 1 ♂, 1 ♀ (MHNR-B 37).
Mauritius. Le Chaland, September 1911, P. Carié coll.: 1 ♂, 2 ♀♀ (MNHN-B 16910).
Indonesia (Indian Ocean). Pulo Boenta, "Te Vega", stn 93, 5°33'N - 95°09'E, 0-0.9 m, 20.XI.1963: 1 ♀ (USNM).

DISTRIBUTION. — Throughout the Indo-West Pacific region except the Persian Gulf and the Hawaiian Islands.

Tetralia fulva Serène, 1984

Tetralia glaberrima fulva Serène, 1984: 282 (part) (Seychelles, Madagascar).

Tetralia glaberrima – Wedenissow 1894: 413 (Somalia). – Alcock 1898: 223 (part) (northeastern Indian Ocean). – Borradaile 1902: 265 (part) (Maldives).

Trapezia digitalis forme *typica* – Bouvier 1915: 273 (part) (Mauritius). Not *T. digitalis* Latreille, 1828.

Material examined. — **Red Sea.** Perim, 1897, F. Jousseaume coll.: 1 ♂ (MNHN-B 25688).
Tanzania. Dar es Salaam, 1971-1972, R. G. Hartnoll coll.: 2 ♂♂, 4 ♀♀ (BMNH 1988.878).
Seychelles. Praslin I., baie Ste Anne, 19.II.1972, A. J. Bruce coll.: 1 ♂, 1 ♀ (MNHN-B 8180); Remire Reef, 12.II.1972: 1 ♂, 1 ♀ (MNHN-B 16820).
Comoro Is. Mayotte, M. Marie coll.: 1 ♀ (MNHN-B 25687).
Madagascar. Nosy Bé, 23.V.1958, A. Crosnier coll.: 3 ♂♂, 3 ♀♀ (MNHN-B 8179); Nosy Komba Pass, September 1960: 1 ♂, 1 ♀ (MNHN-B 8183). — Nosy Komba Pass, 10 m, March 1971, Corfdir coll.: 2 ♂♂, 2 ♀♀ (MNHN-B 12797).
La Réunion. 30 m, S. Ribes coll.: 1 ♂, 1 ♀ (MNHN-B 16821). — Saint Gilles, reef flat, 17.IX.1982, M. de Saint Laurent coll.: 1 ♂, 1 ♀ (MHNR-B 53). — La Saline, reef flat, 1 m, 7.IX.1996, P. Castro & S. Ribes coll.: 2 ♂♂, 3 ♀♀ (MHNR-B 54).
Mauritius. Le Chaland, September 1912, P. Carié coll.: 3 ♂♂, 2 ♀♀ (MNHN-B 13935).
Chagos Archipelago. Speakers Bank, "Odissey", 5°03'N - 72°12.2'E, 20.VI.1984: 1 ♀ (ZISP).
Thailand (Andaman Sea). Phuket I., Cape Phanwa, 16.X.1990, T. Komai coll.: 1 ♂, 2 ♀♀ (CBM ZC 2254).
Christmas I. 1940, C. A. Gibson-Hill coll.: 1 ♂, 1 ♀ (ZRC 1965.11.23.23-25).

Distribution. — Throughout the Indo-West Pacific region except the Persian Gulf and the Hawaiian Islands.

Tetralia nigrolineata Serène *et* Dat, 1957

Tetralia glaberrima forma *nigrolineata* Serène *et* Dat, 1957: 120.

Tetralia glaberrima nigrifrons – Serène 1984: 283, pl. 40F (La Réunion). Not *Tetraloides nigrifrons* (Dana, 1852).

Tetralia glaberrima obscura – Morgan 1990: 51 (Western Australia).

Material examined. — **Seychelles.** Mahé, North East Point, NIOP-I, Tyro Expedition, stn 604, 4°35'S - 55°28'E, reef flat and slope, 4 m, 8.XII.1992, B. Hoeksema coll.: 1 ♂, 1 ♀ (RMNH D 47223); Mahé, cap Maçons/anse des Forbans, stn 612, 4°46'S - 55°31'E, reef flat and slope, 5 m, 12.XII.1992, C. Fransen coll: 1 ♂ (RMNH D 47224).
Aldabra. 1 ♂, 1 ♀ (MNHN-B 14030).
Mozambique. Coconut Bay, 17.V.1973: 1 ♂ (SAM A43252).
La Réunion. S. Ribes coll.: 1 ♂, 1 ♀ (MNHN-B 8182). — La Saline, reef flat, 1 m, 7.IX.1996, P. Castro & S. Ribes coll.: 2 ♂♂, 1 ♀, 1 juv. (MHNR-B 55); reef flat, 1 m, *Acropora abrotanoides*, 9.IX.1996: 2 ♂♂, 3 ♀♀, 1 juv. (MHNR-B 56); outer reef slope, 20 m, *A. humilis*, 8.IX.1996: 1 juv. (MHNR-B 57).

Distribution. — Known from the western Indian Ocean as far north as the Seychelles to the western (Japan to the Coral Sea) and central (Marshall Is to Tonga) Pacific Ocean.

Remarks

The carapace and walking legs of live juveniles and small adults from La Réunion varied from white to light pink or light brown as shown by Serène (1984: pl. 40F). The smallest individuals were all white. A crest was usually present on the cheliped merus of most of these small individuals.

Tetralia rubridactyla Garth, 1971

Tetralia glaberrima rubridactyla Garth, 1971: 185 (Maldives).

Tetralia glaberrima – Borradaile 1902: 265 (part) (Maldives) – Rathbun 1911: 235 (part) (Seychelles). – Barnard 1950: 280, fig. 52c, d (Mozambique). – Garth 1984: 120 (part) (Seychelles). – Kalk 1995: 228, fig. 8.10b (Mozambique). – Jones 1997: 234, unnumb. fig. (eastern Indian Ocean).

Tetralia glaberrima laevissima – Serène 1984: 282, fig. 188, pl. 40A, B (Kenya, Madagascar, La Réunion).

Tetralia glaberrima fulva Serène, 1984: pl. 40D (part) (Seychelles). Not *T. fulva* Serène, 1984.

Tetralia heterodactyla fusca – Serène 1984: 283 (part) (Seychelles). Not *Tetraloides heterodactyla* (Heller, 1861).

Tetralia rubridactyla – Galil 1988a: 65, figs 1d, 2g, h (Maldives, Sri Lanka). – Castro 1999 (Somalia, Kenya, Seychelles, Aldabra, Mozambique, Comoro Is, Madagascar, La Réunion, Mauritius, Maldives).

Tetralia innamorata Galil *et* Clark, 1988: 138, figs 1B, 2A, 3B, 4B, 4G, 6B (Somalia, Kenya, Tanzania, Seychelles, Aldabra).

Material examined. — **Somalia.** Gesira, 1981, M. Vannini coll.: 1 ♂, 1 ♀ paratypes of *T. innamorata* (BMNH 1987.76).
Kenya. A. J. Bruce coll.: 1 ♂, 1 ♀ (MNHN-B 13345); Mombasa I., 4°04.5'S - 39°40.4'E, 29.III.1971, 1 ♂ holotype of *T. innamorata* (BMNH 1987.23), 1 ♂ paratype of *T. innamorata* (BMNH 1987.24); 20 m, 14.III.1972: 2 ♂♂, 1 ♀ (MNHN-B 12795); Lamu Channel, 10.I.1972: 1 ♂, 1 ♀ (MNHN-B 8159); Tiwi, 4°14'S - 38°36'E, 28.II.1971: 1 ♀ (BMNH).
Seychelles. Coetivy I., Percy Sladen Trust Expedition,

1905: 1 ♂, 2 ♀♀ (USNM). — Praslin I., baie Ste Anne, 19.II.1972, A. J. Bruce coll.: 1 ♂, 1 ♀ (MNHN-B 25383); Mahé, Port Victoria, 15.II.1972: 1 ♀ (MNHN-B 8203); Remire Reef, 12.II.1972: 1 ♂, 1 ♀ (MNHN-B 12799), 1 ♂, 1 ♀ (MNHN-B 13343), 1 ♀ (MNHN-B 13347). — Reves 2 Expedition, stn 27, 4°55.6'S - 54°58.5'E, 52 m, 8.IX.1980: 1 ♀ (MNHN-B 12810). — Mahé, North East Point, NIOP-E Tyro Expedition, stn 604, 4°35'S - 55°28'E, reef flat and slope, 2-4 m, 8.XII.1992, C. Fransen coll.: 2 ♂♂, 3 ♀♀ (RMNH D 47226), 1 ♀ (RMNH D 47220); Mahé, anse Nord d'Est, stn 601, 4°34'S - 55°28'E, reef flat, 3 m, 5.XII.1992: 1 ♂, 1 ♀ (RMNH D 47225); Mahé, cap Maçons/anse des Forbans, stn 612, 4°46'S - 55°31'E, reef flat and slope to 5 m, 12.XII.1992: 1 ♂, 1 ♀ (RMNH D 47227), 1 ♀ (RMNH D 47221); Aride I., stn 711, 4°13'S - 55°40'E, 18-19.XII.1992: 1 ♂ (RMNH D 47228); north-east of Aride I., stn 714, 4°10'S - 55°44'E, 55 m, 19.XII.1992: 1 ♂ (RMNH D 47229); Bird I., stn 723, 3°42'S - 55°12'E, 8-12 m, 21.XII.1992: 1 ♂ (RMNH D 47230); St. Joseph Atoll, stn 759, 5°27'S - 53°21'E, 10 m, 28.XII.1992: 1 ♂, 1 ♀ (RMNH D 47231); Poivre Atoll, stn 767, 5°44'S - 53°18'E, 10 m, 29-31.XII.1992: 1 ♂, 1 ♀ (RMNH D 47222). —"Akademik Petrovsky", 21-24.XII.1983: 1 ♂ (ZMMU Ma-4488).
Aldabra. "Calypso", 20 m, 16.V.1954: 1 ♂, 1 ♀ (MNHN-B 14026), 1 ♀ (MNHN-B 14037); Comp Reef, 12 m, 15.V.1954: 2 ♂♂, 2 ♀♀ (MNHN-B 14027). — Main Channel, Royal Society Expedition, 10.XII.1967, J. D. Taylor coll.: 3 ♂♂, 1 ♀ (BMNH).
Farquhar I. 26.II.1972, A. J. Bruce coll.: 1 ♂, 1 ♀ (MNHN-B 12796).
Comoro Is. Mayotte, M. Marie coll.: 1 ♂, 1 ♀ (MNHN-B 13913).
Mozambique. Inhaca I., June 1971: 1 ♂ (SAM A15437). — Delagoa [= Lourenço Marques] Bay: 1 ♂ (SAM A8209).
Madagascar. De Larrigues coll.: 1 ♂ (MNHN-B 13909). — Cap Diego, 15.VIII.1916, H. Poisson coll.: 1 ♂ (MNHN-B 13912). — Banc du Leven, 13.VII.1971, A. J. Bruce coll.: 1 ♀ (MNHN-B 13342); banc du Geyser, 14.III.1972: 1 ♂, 1 ♀ (MNHN-B 8160), 1 ♂, 1 ♀ (MNHN-B 8161).
La Réunion. 20 m, S. Ribes coll.: 1 ♂ (MNHN-B 8181); 1 ♂, 1 ♀ (MNHN-B 8178). — La Saline, outer reef slope, 20 m, 7.IX.1996, P. Castro & S. Ribes coll.: 2 ♂♂, 2 ♀♀ (MHNR-B 58), 1 ♂, 1 ♀ (MHNR-59); *Acropora humilis*, 8.IX.1996: 1 ♂, 1 ♀ (MHNR-B 60); reef flat, 1 m, 7.IX.1996: 1 ♀ (MHNR-B 61); 9.IX.1996: 1 ♂, 1 ♀ (MHNR-B 62).
Mauritius. 1913, P. Carié coll.: 1 ♂, 1 ♀ (MNHN-B 25686); Port Louis: 1 ♂ (MNHN-B 13938); Le Chaland: 1 ♂ (MNHN-B 13911).
Maldives. Kaafu Atoll, 22.I.1991, P. Hogarth coll.: 1 ♀ (YU), 1 ♂, 1 ♀ (YU). — Vaavu Atoll, 12-14 m, 17.IV.1996, C. Anderson coll.: 1 ♀ (YU).
Indonesia (Indian Ocean). Poelau Tikoes [= Pulau Tikus], 19.XII.1925, H. C. Kellers coll.: 2 ♂♂, 3 ♀♀ (USNM 75881); November 1925: 2 ♂♂, 2 ♀♀ (USNM).

DISTRIBUTION. — Known from the western Indian Ocean as far north as Somalia to the Pacific Ocean (Japan to French Polynesia) except the Hawaiian Islands.

REMARKS

Colour variations are discussed as part of the revision of the species by Castro (1999).

Tetralia vanninii Galil *et* Clark, 1988

Tetralia vanninii Galil *et* Clark, 1988: 146, figs 1C, 2B, 3C, 4C, 4H, 6C (Somalia, Kenya). – Castro 1997b: 113, fig. 1 (Kenya, Seychelles).

MATERIAL EXAMINED. — **Socotra.** 1996: 1 ♀ (YU).
Kenya. Wasin Is, 5.X.1971, A. J. Bruce coll.: 10 ♂♂, 6 ♀♀ paratypes (BMNH 1986:1037).
Seychelles. Mahé, cap Maçons/anse des Forbans, NIOP-E Tyro Expedition, stn 612, 4°46'S - 55°31'E, reef flat and slope to 5 m, 12.XII.1992, C. Fransen coll.: 1 ♂, 1 ♀ (RMNH D 47218); Aride I., stn 711, 4°13'S - 55°40'E, 18-19.XII.1992: 1 ♀ (RMNH D 47219).

DISTRIBUTION. — Known from the western Indian Ocean (Socotra to the Seychelles) and the Pacific Ocean (Japan to French Polynesia) except the Hawaiian Islands.

REMARKS

Several colour morphs of what is morphologically identical to *T. vanninii* have been discovered in the western and central Pacific Ocean. Unfortunately, the live colour pattern of the type material from East Africa is unknown.

Genus *Tetraloides* Galil, 1986

The two known species of *Tetraloides* are symbionts of reef corals (*Acropora*). As in *Tetralia*, many Indian Ocean records for *Tetraloides* were most probably referred to as *Tetralia glaberrima*.

Tetraloides heterodactyla (Heller, 1861)

Tetralia heterodactyla Heller, 1861a: 14 (part) (Red Sea); 1861b: 354 (part) (Red Sea). – Paulson 1875: 60 (Red Sea).

?*Tetralia glaberrima* – Henderson 1893: 336, 367 (part) (India).

Tetralia glaberrima – Borradaile 1902: 265 (part) (Maldives).

Tetralia pubescens Klunzinger, 1913: 316, pl. 7, fig. 15 (Red Sea). – Balss 1924 (Red Sea). – Ramadan 1936: 36 (Red Sea).

?*Tetralia nigrifrons* – Stella 1953: 65 (Red Sea).

Tetralia heterodactyla heterodactyla – Garth 1974: 205 (part) (Maldives, Sri Lanka).

Tetralia heterodactyla fusca – Garth 1971: 185 (Maldives); 1984: 120 (Seychelles). – Serène 1984: 283, pl. 42B (part) (Seychelles, îles Glorieuses, La Réunion).

Tetraloides nigrifrons – Galil 1986a: 72, figs 1-3 (part) (Red Sea, Somalia).

Tetraloides heterodactyla – Galil 1988b: 174, fig. 8 (part) (Red Sea). – Galil & Clark 1988: 147, figs 1D, 3D, 4D, 4I, 6D (Red Sea, Somalia, Kenya, Christmas I.).

MATERIAL EXAMINED. — **Somalia.** Gesira, November-December 1976, M. Vannini coll.: 1 ♂ (RMNH D 47266).
Kenya. Bambuni Beach, 19-26.XI.1969, L. B. Holthuis coll.: 1 ♀ (RMNH D 47267).
Seychelles. Poivre Atoll, NIOP-E Tyro Expedition, stn 767, 5°44'S - 53°18'E, 10 m, 29-31.XII.1992, C. Fransen coll.: 1 ♀ (RMNH D 47232).
La Réunion. La Saline, outer reef slope, 20 m, *Acropora humilis*, 7.IX.1996, P. Castro & S. Ribes coll.: 1 ♂, 1 ♀ (MHNR-B 39).
Maldives. Thaa Atoll, 12 m, 11.IV.1996, C. Anderson coll.: 1 ♂, 1 ♀ (YU); Laamu Atoll, 8 m, 14.IV.1996: 1 ♂, 1 ♀ (YU).

DISTRIBUTION. — Throughout the Indo-West Pacific region except the Persian Gulf and the Hawaiian Islands.

Tetraloides nigrifrons (Dana, 1852)

Tetralia nigrifrons Dana, 1852a: 83.

Tetralia cavimanus – Miers 1884b: 537 (part) (Indian Ocean). Not *T. cavimana* Heller, 1861.

?*Tetralia glaberrima* – Henderson 1893: 336, 367 (part) (India).

Tetralia glaberrima – Borradaile 1902: 265 (part) (Maldives). – Rathbun 1911: 235 (part) (Seychelles).

Tetralia heterodactyla heterodactyla – Garth 1971: 185 (Maldives). Not *Tetraloides heterodactyla* (Heller, 1861).

Tetralia heterodactyla – Garth 1974: 205 (part) (Maldives, Sri Lanka); 1984: 120 (Seychelles). – Tsareva 1980: 121 (Western Australia).

Tetralia heterodactyla lissodactyla – Serène 1984: 285, fig. 189, pl. 42C (Seychelles, îles Glorieuses, La Réunion).

Tetraloides nigrifrons – Galil 1986a: 72 (part) (Seychelles, Christmas I., Maldives?, Sri Lanka?). – Galil & Clark 1988: 149, figs 1E, 3E, 4E, 4J, 5B, 6E (Somalia, Kenya, Christmas I.). – Castro 1997a: 72, pl. 1F (Seychelles, îles Glorieuses, La Réunion).

MATERIAL EXAMINED. — **Seychelles.** Coetivy I., Percy Sladen Trust Expedition, 1905: 1 ♂, 1 ♀ (USNM 41338). — Mahé, cap Maçons/anse des Forbans, NIOP-E Tyro Expedition, stn 612, 4°46'S - 55°31'E, reef flat and slope to 5 m, *Acropora*, 12.XII.1992, C. Fransen coll.: 1 ♂, 1 ♀ (RMNH D 47233); St. Joseph Atoll, stn 759, 5°27'S - 53°21'E, 10 m, 28.XII.1992: 1 ♂, 1 ♀ (RMNH D 47234).
Aldabra. Main Channel, Royal Society Expedition, 10.XII.1967, J. Taylor coll.: 1 ♂, 1 ♀ (BMNH).
La Réunion. La Saline, outer reef slope, 20 m, *Acropora humilis*, 7.IX.1996, P. Castro & S. Ribes coll.: 1 ♂, 1 ♀ (MHNR-B 38).

DISTRIBUTION. — Recorded throughout the Indo-West Pacific region except the Red Sea, Persian Gulf, Indonesia and the Hawaiian Islands.

Genus *Trapezia* Latreille, 1828

All twenty-two known living species of *Trapezia* are symbionts of pocilloporid corals.

Trapezia cymodoce (Herbst, 1801)

Cancer cymodoce Herbst, 1801: 22, pl. 51, fig. 5 (Red Sea).

Trapezia cymodoce – Savigny 1817: pl. 5, fig. 2 (Red Sea). – Audouin 1826: 85 (Red Sea). – Coulon 1864: 569 (Red Sea). – Hilgendorf 1869: 76, pl. 2, fig. 4 (part) (Zanzibar); 1879: 798 (Mozambique). – Miers 1878: 408 (Red Sea, Sri Lanka); 1884b: 520, 535 (Seychelles, îles Glorieuses). – De Man 1880: 177 (Red Sea); 1881: 94 (Red Sea); 1887: 69 (Andaman Sea). – Henderson 1893: 336, 366 (India). – Wedenissow 1894: 412 (part) (Somalia). – Del Prato 1896: 183 (Red Sea). – Alcock 1898: 219 (Arabian Sea, Sri Lanka, Andaman Sea, Andaman Is, Nicobar Is). – Nobili 1901: 15 (Red Sea); 1903: 18 (India); 1905: 10 (Tanzania); 1906a: 143 (Red Sea); 1906b: 292 (Red Sea, Gulf of Aden). – Borradaile 1902: 265 (part) (Maldives). – Doflein 1904: 104 (Seychelles). – Lenz 1905: 351, 390 (Tanzania, Aldabra, Europa I.);

1910: 552 (Europa I., Madagascar); 1912: 4 (Red Sea). – Laurie 1906: 410 (part) (Sri Lanka); 1915: 415, 460 (part) (Red Sea). – Calman 1909: 705 (Christmas I.). – Stebbing 1910: 304 (South Africa). – Rathbun 1911: 234 (part) (Seychelles, Cargados Carajos Is, Chagos Archip.). – Bouvier 1915: 272 (part) (Mauritius). – Gravier 1920: 469 (Madagascar). – Balss 1924: 13 (Red Sea). – Gravely 1927: 144 (India). – Pesta 1928: 72 (Red Sea). – Balss 1935a: 145, 146 (Western Australia); 1935b: 40 (Western Australia). – Ramadan 1936: 35 (Red Sea). – Chopra & Das 1937: 410 (Arabian Sea, Bay of Bengal, Andaman Sea). – Gurney 1938: 76, pl. 2, figs 23-28 (Red Sea). – Monod 1938: 141 (Red Sea). – Vatova 1943: 22 (Somalia). – Stephensen 1945: 161, figs 42A, B (Persian Gulf). – Barnard 1950: 276, fig. 52a, b (part) (South Africa). – Tweedie 1950: 126 (part) (Cocos [Keeling] Is). – Stella 1953: 64 (Red Sea). – Fourmanoir 1954: 13 (part) (Madagascar). – Sankarankutty 1961: 131 (Laccadive Is); 1962: 147 (Andaman Is); 1966b: 51 (Seychelles, Maldives). – Guinot 1962a: 240 (part) (Red Sea, Maldives); 1962b: 2 (Gulf of Aden). – Michel 1964: 30 (Mauritius). – Day 1969: 117, unnumb. fig. (South Africa). – Kensley 1970: 104 (Mozambique). – Garth 1971: 188 (part) (Maldives); 1974: 205 (part) (Maldives, Sri Lanka); 1984: 120 (part) (Seychelles). – Serène 1971: figs 26, 28, 30, 32 (Mauritius); 1977: 50 (Seychelles); 1984: 272, fig. 179, pl. 38B (part) (Kenya, Madagascar, Seychelles). – Lundoer 1974: 7 (Andaman Sea). – Edwards & Emberton 1980: 237 (Red Sea). – Tsareva 1980: 118 (Western Australia). – Türkay 1981: 59 (Mauritius). – Black & Prince 1983: 140 (Western Australia). – Galil 1988b: 161, fig. 1 (Red Sea). – Hogarth 1989: 106, 114 (Oman); 1994: 102 (Oman). – Morgan 1990: 51 (Western Australia). – Kalk 1995: 228, fig. 8.10c (as *Quadrella coronata*) (Mozambique). – Jones 1997: 234, unnumb. fig. (eastern Indian Ocean).

Trapezia coerulea Rüppell, 1830: 27, pl. 5, fig. 7, pl. 6, fig. 22 (part) (Red Sea). – Heller 1861a: 13 (Red Sea); 1861b: 348 (Red Sea); 1865: 25, 256, 261 (Nicobar Is). – Kossmann 1877: 44 (part) (Red Sea). – Richters 1880: 152 (Mauritius).

Grapsillus dentatus MacLeay, 1838: 67, pl. 3, unnumbered fig. (South Africa). – Krauss 1843: 35 (South Africa).

?*Trapezia dentifrons* – Hess 1865: 136 (Western Australia).

Trapezia ferruginea – Milne Edwards 1868: 71 (part) (Zanzibar, Madagascar).

Trapezia ferruginea var. *coerulea* – Paulson 1875: 53, 57, pl. 7, figs 4, 4a (Red Sea).

?*Trapezia ferruginea* var. *cymodoce* – Paulson 1875: 56, 57 (Red Sea).

Trapezia cymodoce var. *typica* – Ortmann 1893: 481 (Maldives); 1894: 54 (Tanzania).

?*Trapezia ferruginea* var. *dentata* – Borradaile 1902: 264 (Maldives).

Trapezia dentata – Klunzinger 1913: 310, pl. 4, fig. 10 (Red Sea).

Trapezia cymodoce var. *ornatus* – Chen 1933: 108, fig. 53 (Sri Lanka).

Quadrella rufopunctata – Chen 1933: III, fig. 55 (Sri Lanka).

MATERIAL EXAMINED. — **Red Sea.** No location: 3 ♂♂, 2 ♀♀ (MNHN-B 2925); 1 ♂ (MNHN-B 4342); Clot-Bey coll., 1 ♂, 2 ♀♀ (MNHN-B 2922), 2 ♀♀ (MNHN-B 2923), 2 ♀♀ (MNHN-B 2938), 1 ♀ (MNHN-B 2940 part); 1897, F. Jousseaume coll.: 1 ♂, 1 ♀ (MNHN-B 9703), 2 ♂♂, 1 ♀ (MNHN-B 16604), 1 ♀, 3 ♀♀ (MNHN-B 16606), 2 ♂♂, 1 ♀ (MNHN-B 16899). — Tor [= El Tur], January-July 1826, E. Rüppell coll.: 1 ♂ lectotype of *Trapezia coerulea* Rüppell (SMF 4101); 1 ♂, 2 ♀♀ syntypes of *T. coerulea* (SMF 1567); 10 ♂♂, 14 ♀♀ paralectotypes of *T. coerulea* (SMF 17716). — Gulf of Suez, end of canal, 1934, A. Gruvel coll.: 6 ♂♂, 1 ♀ (MNHN-B 16824). — Suez, Vaillant coll.: 1 ♂ (MNHN-B 2945). — Eilat, *Stylophora*: 1 ♂, 1 ♀ (MNHN-B 22355). — Massawa, stn 17, 1901, J. Bonnier & C. Pérez coll.: 4 ♂♂, 10 ♀♀ (MNHN-B 25372). — Sarso I., "Xarifa", *Seriatopora*, 2-3 m, 16-21.XI.1957, S. Gerlach coll.: 3 ♂♂ (1 feminized by sacculinid), 1 ♀ (MNHN-B 16884). — Perim I., F. Jousseaume coll.: 14 ♂♂, 15 ♀♀ (MNHN-B 25352). — Gulf of Suez, stn 11, 8.XII.1928, R. Dollfus coll.: 1 ♂ (MNHN-B 16896); stn 17 bis, 25.XII.1928: 3 ♂♂, 3 ♀♀ (MNHN-B 16904); Jubal, 29.XII.1928: 1 ♂ juv. (MNHN-B 16897); Gulf of Akaba, stn 38, 4.II.1929: 1 ♂ (MNHN-B 16903). — "Calypso", 1952: 1 ♂, 1 ♀ (MNHN-B 16607), 1 ♂ (MNHN-B 16825); Abu Lat I.: 1 ♂, 1 ♀ (MNHN-B 16605); stn 5: 1 ♂, 1 ♀ (MNHN-B 16602); stn 9: 1 ♂ (MNHN-B 16603); stn 100: 2 ♂♂, 4 ♀♀ (MNHN-B 16608).

Gulf of Aden. Aden, 1897, F. Jousseaume coll.: 1 ♂, 1 ♀ (MNHN-B 16902). — Aden 1897, E. Simon coll.: 7 ♂♂, 3 ♀♀ (MNHN-B 25340). — Djibouti, 1893, M. Maindron coll.: 1 ♀ (MNHN-B 8538 part). — Djibouti, 15.I.1906, C. Gravier coll.: 1 ♂, 1 ♀ (MNHN-B 25353). — Djibouti, 1897, F. Jousseaume coll.: 24 ♂♂, 24 ♀♀ (MNHN-B 25741); Obock: 1 ♂, 1 ♀ (MNHN-B 16905). — "Odissey", cr. 34, 13°59.5'N - 48°24.7'E, 3-5 m, 23.IV.1985: 6 ♂♂, 13 ♀♀ (ZMMU Ma-4477).

Oman. Muscat, M. Maindron coll.: 1 ♂, 1 ♀ (MNHN-B 17493). — *Pocillopora damicornis*, P. W. Glynn coll.: 3 ♂♂, 3 ♀♀ (LACM); Bandar Khayran, *Stylophora pistillata*, 28.IX.1982: 1 ♂, 1 ♀ (LACM);

off Christian Cemetery, *P. damicornis*, 28.IX.1982: 2 ♂♂, 4 ♀♀ (LACM).
Persian Gulf. Juraid I., 27°11'48"N - 49°57'24"E, 4.X.1956, C. E. Dawson coll.: 1 ♂ (USNM 101920), 1 ♂ (USNM).
Kenya. Shimoni, 4°38.8'S - 39°21.7'E, 20.X.1971, A. J. Bruce coll.: 1 ♂, 2 ♀♀ (MNHN-B 8230).
Tanzania. Zanzibar, G. Grandidier coll.: 1 ♀ (MNHN-B 2927). — Zanzibar, L. Rousseau coll.: 1 ♀ (MNHN-B 2935 part), 2 ♂♂ (MNHN-B 2936). — Zanzibar, 4.IX.1959, A. J. Bruce coll.: 1 ♂, 1 ♀ (RMNH D 34987); 25.IX.1960: 2 ♀♀ (RMNH D 34986).
Seychelles. Mahé, 1892, Alluod coll.: 1 ♂, 2 ♀♀ (MNHN-B 23088). — Mahé, 1.VI.1966, A. J. Bruce coll.: 4 ♂♂, 2 ♀♀, 2 juv. (LACM); Praslin I., baie Ste Anne, 19.II.1972: 1 ♂, 1 ♀ (MNHN-B 8228), 1 ♂ (MNHN-B 8229); Curieuse Bay, *Seriatopora hystrix*, 20.II.1972: 2 ♂♂, 2 ♀♀ (MNHN-B 13341); Mahé, 15.II.1972: 1 ♂, 1 ♀ (MNHN-B 8227), 1 ♀ (MNHN-B 13339); Coetivy I., 32 m, 21.II.1972: 1 ♂ (MNHN-B 13333). — Reves 2 Expedition, 32 m: 1 ♂, 2 ♀♀ (MNHN-B 9698); stn 1, 5°24'S - 57°01.4'E, 55 m, 2.IX.1980: 1 ♀ (MNHN-B 12801); stn 7, 4°52.8'S - 56°01.4'E, 57 m, 30.IX.1980: 1 ♂, 1 ♀ (MNHN-B 12803); stn 18, 5°44.9'S - 56°35.5'E, 50 m, 5.IX.1980: 1 ♂, 3 ♀♀ (MNHN-B 12804); stn 24, 5°08.8'S - 55°25.5'E, 35 m, 8.IX.1980: 1 ♂ (MNHN-B 12800), 1 ♂, 1 ♀ (MNHN-B 11626); stn 27, 4°55.6'S - 54°58.5'E, 52 m, 8.IX.1980: 2 ♂♂, 1 ♀ (MNHN-B 20655); stn 34, 4°25'S - 54°53.2'E, 60 m, 10.IX.1980: 3 ♂♂, 1 ♀ (MNHN-B 12807); stn 38, 5°02.6'S - 56°49'E, 44 m, 13.IX.1980: 1 ♂, 1 ♀ (MNHN-B 12805); stn 60, 4°10.3'S - 55°11.8'E, 46 m, 19.IX.1980: 1 ♂, 3 ♀♀ (MNHN-B 11625), 1 ♂ (MNHN-B 12802); stn 62, 4°10'S - 55°25.4'E, 68 m, 19.IX.1980: 1 ♀ (MNHN-B 12809). — West of Aride I., NIOP-E Tyro Expedition, stn 702, 4°13'S - 55°34'E, 47 m, 17.XII.1992: 1 ♂ (RMNH D 47235); north-west of Praslin I., stn 705, 4°16'S - 55°40'E, 25 m, 17.XII.1992: 3 ♂♂, 4 ♀♀ (RMNH D 47236); south-east of Mahé, stn 738, 4°45'S - 55°33'E, 35-45 m, 24.XII.1992: 1 ♂ (RMNH D 47237); north of Poivre Atoll, stn 766, 5°44'S - 53°20'E, 43-48 m, 29.XII.1992: 1 ♂ (RMNH D 47238).
Aldabra. "Calypso", 1954: 1 ♂ (MNHN-B 14028); 42 m, 23.V.1954: 1 ♂, 1 ♀ (MNHN-B 14033).
Saya de Malha Bank. "Odissey", cr. 33, 12-13 m, 9.VI.1984: 1 ♂, 1 ♀ (ZMMU); 6 ♂♂, 6 ♀♀ (ZMMU Ma-4413).
Comoro Is. Mayotte: 4 ♂♂, 3 ♀♀ (MNHN-B 16888).
Îles Glorieuses. 10 m, A. Crosnier coll., January 1973: 1 ♂ (MNHN-B 13338).
Mozambique. Lourenço Marques [= Maputo], June 1920: 1 ♂, 1 ♀ (SAM A43241). — Inhaca I., 19.II.1951, O. Tattersall coll.: 1 ♂ (BMNH). — Inhaca I., June 1971: 4 ♂♂, 4 ♀♀, 3 juv. (SAM A15432). — Magaruque, 23.V.1973: 1 ♂, 2 ♀♀ (SAM A43233).
South Africa. KwaZulu-Natal, Port Edward, 16.V.1939: 1 ♂, 1 ♀ (SAM A43235). — KwaZulu-Natal, Aliwal Shoal, 24 m, June 1980: 1 ♂, 1 ♀ (SAM A43234).
Madagascar. No location: 1 ♀ (MNHN-B 13340); 1903: 1 ♂, 1 ♀ (MNHN-B 16898); May 1919, R. Decary coll.: 1 ♀ (MNHN-B 16889), 1 ♀ (MNHN-B 16894); De Lartigues coll.: 1 ♀ (MNHN-B 16900). — Diego Suarez, May 1919, R. Decary coll.: 1 ♂, 2 ♀♀ (MNHN-B 23078). — Nosy Bé, 23.V.1958, A. Crosnier coll.: 5 ♂♂, 2 ♀♀ (MNHN-B 8224); Tuléar, October 1958: 1 ♀ (MNHN-B 8225); Ste Luce, 4 m, May 1960: 1 ♀ (MNHN-B 8226). — Tuléar, G. Grandidier coll.: 1 ♂, 1 ♀ (MNHN-B 4344 part). — Tuléar, G. Geay coll., 1906: 4 ♂♂, 5 ♀♀ (MNHN-B 25381). — Tuléar, G. Petit coll.: 1 ♂, 2 ♀♀ (MNHN-B 23077), 2 ♀♀ (MNHN-B 23094); Tamatave: 1 ♀ (MNHN-B 16892). — Tamatave, J. Millot coll.: 1 ♂ (MNHN-B 16890), 1 ♀ juv. (MNHN-B 16891), 3 ♂♂, 4 ♀♀ (MNHN-B 23087).
La Réunion. La Saline, outer reef slope, 40 m, *P. damicornis*, S. Ribes coll.: 1 ♂, 1 ♀ (MHNR-B 8); 30 m, 30.X.1977: 1 ♂, 1 ♀ (MNHN-B 8940). — Le Port, "Marion Dufresne", 10.IX.1982, H. Zibrowius coll.: 1 ♂, 1 ♀ (MNHN-B 12812); stn CP97, 35 m, 28.VIII.1982: 1 ♂ (MNHN-B 12811). — La Saline, reef flat, 1 m, *P. damicornis*, 7.IX.1996, P. Castro & S. Ribes coll.: 1 ♀ (MHNR-B 9).
Mauritius. 1913, P. Carié coll.: 13 ♂♂, 12 ♀♀ (MNHN-B 25379), 1 ♂ (MNHN-B 23082); 1914: 1 ♂ (MNHN-B 13945); 1919: 1 ♂, 1 ♀ (MNHN-B 9701); Port Louis, 1914: 21 ♂♂, 23 ♀♀ (MNHN-B 16785); récif du Grand Port, 1913: 6 ♂♂, 10 ♀♀ (MNHN-B 16786), 23 ♂♂, 28 ♀♀ (MNHN-B 25357); 1919: 1 ♂, 1 ♀ (MNHN-B 9702); Le Chaland, 28.XII.1912: 5 ♂♂, 6 ♀♀ (MNHN-B 25350); 1913: 1 juv. (MNHN-B 23053).
Maldives. Rasdu Atoll, 19.III.1958, W. Klausewitz coll.: 1 ♂ (SMF 12357).
Sri Lanka. Weligama Bay, 1912, L. Beer coll.: 1 ♂ (SMF 11745), 2 ♂♂, 2 ♀♀ (SMF 11740).
Thailand (Andaman Sea). Phuket I., Makham Bay, 26.VIII.1980, P. Castro coll.: colour photographs. — Phuket I., Cape Phanwa, 10.X.1990, T. Komai coll.: 2 ♂♂, 1 ♀ (CBM ZC 2281).
Indonesia (Indian Ocean). Batu Is, Pulo Bai, "Te Vega", stn 101, 0°1'S - 98°31'E, 25.XI.1963: 1 ♂ (USNM).

Distribution. — Throughout the Indo-West Pacific region except the Hawaiian Islands and most of the central Pacific.

Remarks

Records of *T. cymodoce* most probably include

specimens of *T. lutea*. Both species have a conspicuous tomentum along the outer edge of the cheliped propodus.

Live individuals from La Réunion and Phuket Island, Andaman Sea coast of Thailand, showed the colour pattern characteristic of western Pacific populations (Castro 1997a: pl. 2A) but the dorsal surface of the carapace was often dark orange brown. A wide yellow to tan band crossed the ventral surface of the carapace and third maxillipeds.

Trapezia digitalis Latreille, 1828

Trapezia digitalis Latreille, 1828: 696 (Red Sea). – Heller 1861a: 14 (Red Sea); 1861b: 348, 350 (Red Sea). – Kossmann 1877: 44 (Red Sea). – De Man 1880: 177 (Red Sea); 1881: 94 (Red Sea). – Alcock 1898: 222 (Sri Lanka). – Nobili 1906b: 293 (Red Sea). – Calman 1909: 705 (Christmas I.). – Rathbun 1911: 235 (Seychelles, Chagos Archip.). – Klunzinger 1913: 312, pl. 7, fig. 14 (Red Sea). – Balss 1924: 13 (Red Sea). – Pesta 1928: 72 (Red Sea). – Chen 1933: 111 (Sri Lanka). – Ramadan 1936: 35 (Red Sea). – Barnard 1950: 278 (South Africa). – Tweedie 1950: 126 (Cocos [Keeling] Is). – Michel 1964: 31 (Mauritius). – Garth 1971: 188 (Maldives); 1974: 205 (Maldives); 1984: 120 (Seychelles). – Edwards & Emberton 1980: 237 (Red Sea). – Tsareva 1980: 120 (Western Australia). – Black & Prince 1983: 140 (Western Australia). – Serène 1984: 277, fig. 185, pl. 38D (Seychelles, îles Glorieuses, La Réunion). – Galil 1988b: 163, fig. 2 (Red Sea). – Castro 1996: 536, fig. 2 (Red Sea, Seychelles, Madagascar, La Réunion, Mauritius).

Trapezia leucodactyla Rüppell, 1830: 28 (Red Sea).

?*Grapsillus subinteger* MacLeay, 1838: 67 (South Africa).

Trapezia ferruginea var. *digitalis* – Paulson 1875: 55, 57, pl. 7, figs 5, 6 (Red Sea).

Trapezia digitalis var. *typica* – Borradaile 1902: 265 (Maldives).

Trapezia digitalis forme *typica* – Bouvier 1915: 273 (part) (Mauritius).

?*Trapezia subinteger* – Ward 1942b: 100 (Chagos Archip.).

MATERIAL EXAMINED. — **Red Sea.** Jiddah, M. Botta coll.: 2 ♂♂ (MNHN-B 2931). — Abu Lat I., "Calypso", 1952: 4 ♂♂ (1 feminized), 2 ♀♀ (MNHN-B 13924), 1 ♂, 1 ♀ (MNHN-B 13926), 1 ♂ (MNHN-B 13927). — Port Sudan, August-September 1978, H. Emberton coll.: 1 ♂, 2 ♀♀ (RMNH D 47242).

Somalia. Gesiza, M. Vannini coll., November-December 1976: 1 ♂ (RMNH D 32163).

Seychelles. Praslin I., baie Ste Anne, 19.II.1972, A. J. Bruce coll.: 4 ♂♂, 4 ♀♀ (MNHN-B 8266). — Reves 2 Expedition, stn 27, 4°55.6'S - 54°58.5'E, 52 m, 8.IX.1980: 1 ♀ (MNHN-B 20654). — Mahé, cap Maçons/anse des Forbans, NIOP-E Tyro Expedition, stn 612, 4°46'S - 55°31'E, reef flat, under rocks, 12.XII.1992, C. Fransen coll.: 2 ♀♀ (RMNH D 47239); reef flat and slope to 5 m, *Pocillopora verrucosa*: 2 ♂♂ (RMNH D 47240); île Desnœufs, stn 783, 6°12'S - 53°02'E, outer reef slope, 2.I.1993: 1 ♀ (RMNH D 47241); St. François Atoll, stn 792, 7°05'S - 52°44'E, outer reef slope to 27 m, 5-6.I.1993: 1 ♂, 1 ♀ (RMNH D 47242).

Aldabra. "Calypso", 1954: 1 ♂, 1 ♀ (MNHN-B 14031).

Farquhar Is. 26.II.1972, A. J. Bruce coll.: 1 ♂, 2 ♀♀ (MNHN-B 8265).

Saya de Malha Bank. "Odissey", cr. 33, 12-13 m, 9.VI.1984: 2 ♂♂, 1 juv. (ZMMU).

Îles Glorieuses. 16.IX.1958, A. Crosnier coll.: 1 ♂ (MNHN-B 8264).

Mozambique. Coconut Bay, 17.V.1973: 1 ♂, 2 ♀♀ (SAM A43237).

La Réunion. La Saline, outer reef slope, 5 m, S. Ribes coll.: 1 ♂ (MNHN-B 8267); 5 m: 1 ♂ (MNHN-B 13325), 1 ♂, 1 ♀ (MNHN-B 13326), 1 ♂, 3 ♀♀ (MNHN-B 13328); 20 m: 1 ♂, 1 ♀ (MNHN-B 13329); 5 m, *P. eydouxi*: 1 ♂, 1 ♀ (MNHN-B 13324); 5 m, *Stylophora*: 2 ♂♂, 1 ♀ (MNHN-B 13327); 5 m: 2 ♂♂, 3 ♀♀ (MHNR-B 10). — 1982, C. Vadon coll.: 1 ♂, 1 ♀ (MNHN-B 9746); 1 ♂, 1 ♀ (MNHN-B 9747); *P. verrucosa*, 2 ♀♀ (MNHN-B 9748).

Mauritius. Port Louis, 1913, P. Carié coll.: 1 ♂ (MNHN-B 16908); récif du Grand Port, 1913: 1 ♀ (MNHN-B 16907), 1 ♂ (MNHN-B 25361); Île Chaland, October 1911: 1 ♂ (MNHN-B 16909).

Chagos Archipelago. Salomon Is, Percy Sladen Trust Expedition, 1905: 1 ♂, 1 ♀ (USNM 41337). — Diego Garcia, "Vitiaz", cr. 35, 1.5 m, 12.X.1962: 1 ♂ (ZMMU Ma-2206). — Speakers Bank, "Odissey", cr. 33, 5°3.3'S - 72°15.2'E, 10-15 m, 18-21.VI.1984: 3 ♂♂, 6 ♀♀ (ZMMU).

Cocos (Keeling) Is. 1941, C. A. Gibson-Hill coll.: 1 ♂, 2 ♀♀ (ZRC 1965.11.22.77-79), 3 ♂♂, 3 ♀♀ (ZRC 1970.7.23-25).

Christmas I. 1940, C. A. Gibson-Hill coll.: 1 ♂, 1 ♀ (ZRC 1970.7.13.74).

DISTRIBUTION. — Throughout the Indo-West Pacific and eastern Pacific regions except the Persian Gulf.

Trapezia ferruginea Latreille, 1828

Trapezia ferruginea Latreille, 1828: 695 (Red Sea). – Heller 1861a: 13 (Red Sea); 1861b: 348, 349, pl. 4, fig. 40 (Red Sea). – Coulon 1864: 569 (Red

Sea). – Paulson 1875: 7, 52, 57 (Red Sea). – Miers 1878: 407 (Red Sea, Mauritius); 1884b: 536 (Seychelles, Sri Lanka). – De Man 1880: 178 (Red Sea); 1881: 94 (Red Sea). – Alcock 1898: 220 (Sri Lanka, Andaman Is, Nicobar Is). – Nobili 1901: 15 (Red Sea); 1905: 10 (Tanzania); 1906a: 143 (Red Sea); 1906b: 293 (Red Sea). – Calman 1909: 705 (Christmas I.). – Lenz 1910: 553 (Europa I.). – Stebbing 1910: 304 (South Africa). – Balss 1924: 13 (Red Sea). – Pesta 1928: 72 (Red Sea). – Chen 1933: 109 (Sri Lanka). – Ramadan 1936: 35 (Red Sea). – Tweedie 1950: 126 (part) (Cocos [Keeling] Is). – Sankarankutty 1961: 130 (Laccadive Is); 1962: 147 (Andaman Is); 1966b: 51 (Seychelles, Maldives). – Michel 1964: 31 (Mauritius). – Garth 1971: 188 (Maldives); 1974: 205 (Maldives, Sri Lanka); 1984: 120 (Seychelles). – Serène 1971: figs 27, 29, 31, 33 (Mauritius); 1984: 273, fig. 180, pl. 38C (Seychelles, Comoro Is, Madagascar, îles Glorieuses, La Réunion). – Edwards & Emberton 1980: 237 (Red Sea). – Tsareva 1980: 118 (Western Australia). – Galil 1988b: 164, fig. 3 (Red Sea). – Castro 1996: 540, fig. 3 (Red Sea, Seychelles, Comoro Is, Madagascar, La Réunion, Mauritius, Maldives).

Trapezia coerulea Rüppell, 1830: 27 (part) (Red Sea).

?*Cancer cymodoce* – Rüppell 1830: 27 (Red Sea).

Trapezia cymodoce – Heller 1861a: 13 (Red Sea); 1861b: 348, 352 (Red Sea); 1865: 25, 256, 261 (Nicobar Is). – Hilgendorf 1869: 76, pl. 2, fig. 5 (part) (Zanzibar). – Laurie 1915: 460 (part) (Red Sea). Not *T. cymodoce* (Herbst, 1801).

Trapezia ferruginea var. *typica* – Borradaile 1902: 264, figs 41F (as *T. ferruginea*), 42B (Maldives).

Trapezia cymodoce ferruginea – Rathbun 1911: 234 (part) (Seychelles, Chagos Archip.).

Trapezia bidentata Klunzinger 1913: 307, pl. 7, fig. 12 (part) (Red Sea).

Trapezia ferruginea forme *typica* – Bouvier 1915: 272 (Mauritius).

?*Trapezia ferruginea* forme *dentata* – Bouvier 1915: 272 (part) (Mauritius).

Trapezia cymodoce var. *edentula* Laurie, 1915: 461 (Red Sea).

Trapezia guttata – Guinot 1962a: 240 (part) (Maldives). Not *T. guttata* Rüppell, 1830.

MATERIAL EXAMINED. — **Red Sea.** No location: Beaudouin coll.: 1 ♂ (MNHN-B 2947); Clot Bay coll.: 1 ♂ (MNHN-B 2940 part); Quartin, Dillon & G. Petit coll.: 2 ♀♀ (MNHN-B 4343). — Tor [= El Tur], 1826, E. Rüppell coll.: 1 ♂, 1 ♀ syntypes of *Trapezia coerulea* Rüppell (SMF 11759). — The Brothers Is, 1901, J. Bonnier & C. Pérez coll.: 1 ♂ (MNHN-B 16544). — Jiddah, M. Botta coll.: 2 ♂♂ (MNHN-B 2941). — Hofun, 1929, E. Ninni coll.: 1 ♀ (MNHN-B 23057). — Assab, Issel & Beccari coll.: 1 ♀ (MNHN-B 16522). — "Calypso", 1952: 1 ♀ (MNHN-B 16523); Abu Lat I.: 7 ♂♂ (1 feminized), 4 ♀♀ (MNHN-B 13925), 6 ♂♂, 8 ♀♀ (MNHN-B 23056); Marmar, 19.I.1952: 1 ♂, 1 ♀ (MNHN-B 16518). — Port Sudan, August-September 1978, H. Emberton coll.: 2 ♂♂, 2 ♀♀ (RMNH D 47314).
Somalia. Gesira, November-December 1976, M. Vannini coll.: 1 ♂ (RMNH D 32163).
Kenya. Ras Iwatine, 4°01'S - 39°44'E, 1 m, *Stylophora*, 27.II.1971, A. J. Bruce coll.: 5 ♂♂, 8 ♀♀, 1 juv. (BMNH), 4 ♂♂, 3 ♀♀ (BMNH).
Tanzania. Zanzibar, L. Rousseau coll.: 1 ♀ (MNHN-B 2935 part). — Zanzibar, Tutia Reef, 28.II.1971, A. J. Bruce coll.: 1 ♂, 1 ♀ (BMNH).
Seychelles. Praslin I., baie Ste Anne, 19.II.1972, A. J. Bruce coll.: 1 ♂, 1 ♀ (MNHN-B 8236), 4 ♀♀, 1 ♂ (MNHN-B 8945); Remire Reef, 12.II.1972: 2 ♂♂, 3 ♀♀ (MNHN-B 8944). — Reves 2 Expedition, stn 27, 4°55.6'S - 54°58.5'E, 52 m, 8.IX.1980: 2 ♂♂, 5 ♀♀ (MNHN-B 11627), 2 ♂♂ (MNHN-B 12806). — Mahé, anse Nord d'Est, NIOP-E Tyro Expedition, stn 601, 4°34'S - 55°28'E, reef flat, 3 m, 5.XII.1992, C. Fransen coll.: 1 ♂ (RMNH D 47243); Mahé, cap Maçons/anse des Forbans, stn 612, 4°46'S - 55°31'E, reef flat and slope to 5 m, *Pocillopora verrucosa*, 12.XII.1992: 2 ♂♂, 1 ♀ (RMNH D 47244); north-east of Aride I., stn 714, 4°10'S - 55°44'E, 55 m, 19.XII.1992: 1 ♂, 1 ♀ (RMNH D 47245); St. François Atoll, stn 792, 7°05'S - 52°44'E, outer reef slope to 27 m, 5-6.I.1993: 5 ♂♂, 4 ♀♀ (RMNH D 47246); *P. eydouxi*: 1 ♂, 1 ♀ (RMNH D 47247).
Aldabra. "Calypso", 1954: 3 ♂♂, 1 ♀, 2 juv. (MNHN-B 14029).
Astove I. *Stylophora*, 27.II.1972, A. J. Bruce coll.: 4 ♀♀, 1 ♂ (MNHN-B 8942).
Farquhar Is. 26.II.1972, A. J. Bruce coll.: 4 ♂♂, 3 ♀♀ (MNHN-B 8235).
Saya de Malha Bank. "Odissey", cr. 33, 12-13 m, 9.VI.1984: 5 ♂♂, 7 ♀♀ (ZMMU Ma-4410).
Comoro Is. Mayotte, 10 m, September 1959, A. Crosnier coll.: 1 ♀ (MNHN-B 8234).
Îles Glorieuses. 16.IX.1958, A. Crosnier coll.: 2 ♂♂, 2 ♀♀ (MNHN-B 8233). — 16.IX.1958, J. Millot & A. Crosnier coll.: 1 ♀ (MNHN-B 23049).
Mozambique. Jangamo, July 1968: 1 ♂, 1 ♀ (SAM A13514). — Coconut Bay, 17.V.1973: 3 ♂♂, 4 ♀♀, 1 juv. (SAM A43238).
South Africa. KwaZulu-Natal, Aliwal Shoal, 24 m, June 1980: 1 ♂ (SAM A43239).
Madagascar. No location: 1 ♀ (MNHN-B 23045); De Lartigues coll.: 1 ♀ (MNHN-B 16520). — Nosy Bé, July 1958, M. Chavane coll.: 1 ♂ (MNHN-B 8231). — Tuléar, R. Plante & A. Crosnier coll.: 1 ♂, 1 ♀ (MNHN-B 8232).
La Réunion. La Saline, outer reef slope, 5 m, S. Ribes coll.: 2 ♂♂, 3 ♀♀ (MNHN-B 8237), 5 m: 2 ♂♂, 1 ♀ (MNHN-B 16090); 10 m: 1 ♂, 1 ♀ (MNHN-

B 16091); 20 m: 2 ♂♂, 1 ♀ (MNHN-B 16089); 5 m, *Stylophora mordax*, 31.XII.1976: 1 ♀ (MHNR-B 11); 10 m, *P. damicornis*, 23.VIII.1977: 1 ♀ (MHNR-B 12), *P. verrucosa*, 1 ♂ (MHNR-B 13); reef flat, 30.VII.1977: 1 ♂, 1 ♀ (MNHN-B 16088). — La Saline, "Marion Dufresne", 13 m, 16.IX.1982: 1 ♂ (MNHN-B 16548). — Saint Gilles, reef flat, 16.IX.1982, M. de Saint Laurent coll.: 1 ♂ (MHNR-B 14). — La Saline, outer reef slope, 20 m, *P. brevicornis*, coll., 8.IX.1997, P. Castro & S. Ribes: 1 ♂ (MHNR-B 42); Saint Gilles, reef flat, 1 m, *P. verrucosa*, 11.IX.1996: 1 ♂, 1 ♀ (MHNR-B 43); 1 ♂, 1 ♀ (MHNR-B 44), 1 ♀ (MHNR-B 45).
Mauritius. 1 ♀ (MNHN-B 2946). — 1887, M. Marie coll.: 1 ♀ (MNHN-B 16519). — P. Carié coll.: 3 ♂ (MNHN-B 16516); 1913: 1 ♀ (MNHN-B 23064); récif du Grand Port, 1913: 5 ♂♂, 9 ♀♀ (MNHN-B 25359); Le Chaland, 1913: 1 ♂, 1 ♀ (MNHN-B 16521), 4 ♂♂, 2 ♀♀, 2 juv. (MNHN-B 16524).
Maldives. Addu Atoll, "Xarifa", 9 m, 30.12.1957, S. Gerlach coll.: 1 ♂ (MNHN-B 16517). — Miladummadulu Atoll, 27.III.1964, R. Robertson coll.: 1 ♀ (LACM).
Chagos Archipelago. Speakers Bank, "Odissey", cr. 33, 5°03.3'S - 72°15.2'E, 10-15 m, 18-21.VI.1984: 14 ♂♂, 14 ♀♀ (ZMMU Ma-4419).
Sri Lanka. Galle, 5.III.1964, J. S. Garth coll.: 1 ♂, 1 ♀ (LACM).
Cocos (Keeling) Is. 1941, C. A. Gibson-Hill coll.: 2 ♂♂, 7 ♀♀ (ZRC 1965.11.22.100-109); 5 ♂♂, 4 ♀♀ (ZRC 1970.7.13.51-52).
Christmas I. 1940, C. A. Gibson-Hill coll.: 1 ♀ (ZRC 1970.7.13.73).

DISTRIBUTION. — Throughout the Indo-West Pacific and eastern Pacific regions except the Persian Gulf.

REMARKS

Live individuals from La Réunion where darker than those from western Pacific Ocean populations. The dorsal surface of the carapace varied from purplish orange to dark orange; the edges were orange.

Trapezia flavopunctata Eydoux *et* Souleyet, 1842

Trapezia flavopunctata Eydoux *et* Souleyet, 1842: 230, pl. 2, fig. 3.

Trapezia flavopunctata – Miers 1884a: 11 (Mauritius). – Serène 1984: 276, fig. 183, pl. 42A (La Réunion, Mauritius).

Trapezia ferruginea forme *areolata* – Bouvier 1915: 272 (Mauritius). Not *T. areolata* Dana, 1852.

Trapezia rufopunctata forme *flavopunctata* – Bouvier 1915: 273 (Mauritius).

Trapezia maculata – Gravier 1920: 470 (part) (Madagascar).

Trapezia rufopunctata flavopunctata – Michel 1964: 31 (Mauritius).

Trapezia ferruginea areolata – Michel 1964: 31 (Mauritius). Not *T. areolata* Dana, 1852.

Trapezia tigrina – Serène 1971: 133, fig. 4 (Sri Lanka ?). Not *T. tigrina* Eydoux *et* Souleyet, 1847.

MATERIAL EXAMINED. — **Madagascar.** Diego Suarez, May 1919, R. Decary coll.: 1 ♀ (MNHN-B 23079).
La Réunion. 5 m, *Pocillopora eydouxi*, S. Ribes coll.: 1 ♂ (MNHN-B 8315); 1976: 14 ♂♂, 4 ♀♀ (MNHN-B 16092); 10 m, *P. verrucosa*, 30.IX.1976: 1 ♀ (MHNR-B 15); 10 m, 24.VII.1977: 1 ♂, 1 ♀ (MNHN-B 21495); La Saline, 15 m, *P. verrucosa*: 1 ♂, 1 ♀ (MNHN-B 8248). — La Saline, reef flat, 16.IX.1982, M. de Saint Laurent coll.: 1 ♂ (MNHN-B 16546). — La Saline, 1 m, *P. verrucosa*, 11.IX.1996, P. Castro & S. Ribes coll.: 2 ♂♂, 4 ♀♀ (MHNR-B 16).
Mauritius. 1 ♂, 1 ♀ (MNHN-B 23080). — M. Marie coll.: 1 ♂ (MNHN-B 23092). — P. Carié coll.: 1 ♀ (MNHN-B 2949); 1910, 1 ♀ (MNHN-B 25336); 1913, 9 ♂♂ (MNHN-B 8249), 2 ♂♂ (MNHN-B 9781), 5 ♂♂, 15 ♀♀ (MNHN-B 16540), 4 ♂♂, 1 ♀ (MNHN-B 23061), 1 ♂, 1 ♀ (MNHN-B 23073), 10 ♀♀, 7 ♂♂ (MNHN-B 23081), 5 ♀♀, 1 ♂ (MNHN-B 25337); 1914, 30 ♂♂, 30 ♀♀ (MNHN-B 16539), 2 ♂♂, 2 ♀♀ (MNHN-B 23042); Port Louis, 1 ♀ (MNHN-B 2948), 2 ♂♂, 1 ♀ (MNHN-B 25349); récif du Grand Port, 1913, 1 ♀ (MNHN-B 25362).
Chagos Archipelago. Diego Garcia, 7°14'47"S - 72°23'02"E, 1-3 m, 16.VII.1967: 1 ♀ (LACM).

DISTRIBUTION. — Known only from the southwestern Indian Ocean to most of the Pacific Ocean, except the eastern Pacific region.

Trapezia formosa Smith, 1869

Trapezia formosa Smith, 1869: 286.

Trapezia digitalis var. *formosa* – Borradaile 1902: 265 (Maldives).

Trapezia ferruginea – Tweedie 1950: 126 (part) (Cocos [Keeling] Is). Not *T. ferruginea* Latreille, 1828.

Trapezia formosa – Garth 1971: 188 (Maldives). – Castro 1998b: 178 (Kenya, Seychelles, Aldabra, Mozambique, îles Glorieuses, La Réunion, Cocos [Keeling] Is).

Trapezia bella – Serène 1984: 278, fig. 187, pl. 38F (La Réunion). Not *T. bella* Dana, 1852.

MATERIAL EXAMINED. — **Kenya.** Ras Iwatine, 4°01'S - 39°44'E, 1 m, *Stylophora*, 27.II.1971, A. J. Bruce coll.: 1 ♂, 1 ♀ (BMNH); Tiwi, 4°15'S - 38°36.1'E, 2 m, 1.III.1971: 1 ♀ (BMNH). — Mombasa Is, *Pocillopora* under stones, 14.III.1972, N. Bruce coll.: 1 ♂ (MNHN-B 25292).
Seychelles. Praslin I., small *Pocillopora*, 17.II.1972, A. J. Bruce coll.: 5 ♂♂, 6 ♀♀ (MNHN-B 25289); Remire Reef, 12.II.1972: 1 ♂, 1 ♀ (MNHN-B 25288). — Reves 2 Expedition, stn 27, 4°55.6'N - 54°58.5'E, 52 m, 8.IX.1980: 1 ♂ (MNHN-B 25290). — Mahé, cap Maçons/anse des Forbans, NIOP-E Tyro Expedition, stn 612, 4°46'S - 55°31'E, reef flat and slope to 5 m, *P. verrucosa*, 12.XII.1992, C. Fransen coll.: 2 ♂♂ (RMNH D 47110); Aride I., stn 711, 4°13'S - 55°40'E, *P. verrucosa*, 18-19.XII.1992: 1 ♂ (RMNH D 47109); St. François Atoll, stn 792, 7°05'S - 52°44'E, outer reef slope to 27 m, *P. eydouxi*, 5-6.I.1993: 1 ♂, 1 ♀ (RMNH D 47107), 1 ♂ (RMNH D 47111).
Aldabra. 1 ♂, 1 ♀ (MNHN-B 14034).
Îles Glorieuses. 16.IX.1958, A. Crosnier & J. Millot coll.: 2 ♂♂, 1 ♀ (MNHN-B 25291).
Mozambique. Coconut Bay, 17.V.1973: 1 ♀ (SAM A43242).
La Réunion. La Saline, outer reef slope, 5 m, S. Ribes coll.: 1 ♂, 1 ♀ (MNHN-B 23100); 5 m, *Stylophora*: 3 ♂♂, 2 ♀♀ (MNHN-B 23096); 5 m, *P. verrucosa*: 1 ♂, 1 ♀ (MNHN-B 23097); 10 m, *P. verrucosa*: 1 ♂, 1 ♀ (MHNR-B 25); 15 m: 2 ♂♂, 2 ♀♀ (MNHN-B 23098), 1 ♂ (MNHN-B 23099); 5 m, *P. verrucosa*: 1 ♂, 1 ♀ (MNHN-B 8345). — Saint Gilles, reef flat, 17.IX.1982, M. de Saint Laurent coll.: 1 ♂ (MHNR-B 26).
Cocos (Keeling) Is. 1941, C. A. Gibson-Hill coll.: 1 ♂, 2 ♀♀ (ZRC 1997.777).

DISTRIBUTION. — Recorded across the Indo-West Pacific and eastern Pacific regions except the Red Sea, Persian Gulf, French Polynesia and the Hawaiian Islands.

REMARKS

Colour variations throughout the geographic distribution are discussed in the revision of the species by Castro (1998b).

Trapezia guttata Rüppell, 1830

Trapezia guttata Rüppell, 1830: 27 (Red Sea). – Heller 1861a: 14 (Red Sea); 1861b: 348, 351 (Red Sea). – Kossmann 1877: 44 (Red Sea). – De Man 1880: 176 (Red Sea); 1881: 94 (Red Sea). – Richters 1880: 152 (Seychelles). – Lenz 1905: 350, 390 (Tanzania, Aldabra). – Nobili 1906b: 293 (Red Sea). – Gurney 1938: 76, pl. 2, figs 19-22 (Red Sea). – Tweedie 1950: 126 (Cocos [Keeling] Is). – Stella 1953: 64 (Red Sea). – Guinot 1962a: 240 (part) (Red Sea, Maldives). – Michel 1964: 31 (Mauritius). – Kensley 1970: 104 (Mozambique). – Garth 1971: 188 (Maldives); 1984: 120 (Seychelles). – Serène 1977: 50 (Seychelles); 1984: 271, fig. 178, pl. 38A (Seychelles, Madagascar, La Réunion). – Edwards & Emberton 1980: 237 (Red Sea). – Tsareva 1980: 119 (Western Australia). – Türkay 1981: 59 (Seychelles). – Galil 1988b: 166, fig. 4 (Red Sea). – Morgan 1990: 52 (Western Australia). – Kalk 1995: 228 (Mozambique).

Trapezia ferruginea – Milne Edwards 1868: 71 (part) (Madagascar).

Trapezia ferruginea var. *guttata* – Paulson 1875: 7, 54, 57 (Red Sea). – Borradaile 1902: 265 (Maldives). – Doflein 1904: 104 (Seychelles). – Ramadan 1936: 35 (Red Sea).

Trapezia cymodoce ferruginea – Rathbun 1911: 234 (part) (Chagos Archip.). Not *T. ferruginea* Latreille, 1828.

? *Trapezia ferruginea* var. *ceylonica* Chen 1933: 109, fig. 54 (Sri Lanka).

Trapezia bidentata Klunzinger, 1913: 307 (part) (Red Sea).

Trapezia sp. – Fourmanoir 1954: 13 (Madagascar).

MATERIAL EXAMINED. — **Red Sea.** 1822-1827, E. Rüppell coll.: 1 ♂ syntype (RMNH D 42320). — Eilat, *Stylophora*: 1 ♂, 1 ♀ (MNHN-B 23055). — "Calypso", 1952: 1 ♂ (MNHN-B 16916), 1 ♂, 1 ♀ (MNHN-B 16914); stn 5: 2 ♂♂, 1 ♀ (MNHN-B 23065); Abu Lat I.: 1 ♀ (MNHN-B 16531). — Sarso I., "Xarifa", 2-3 m, 11.XI.1957, S. Gerlach coll.: 1 ♂, 4 ♀♀ (MNHN-B 16917); *Seriatopora*, 16-21.XI.1957: 2 ♂♂, 1 ♀ (MNHN-B 16918). — Port Sudan, August-September 1978, H. Emberton coll.: 1 ♂, 1 ♀ (RMNH D 47319).
Seychelles. Mahé, Port Victoria, *Stylophora erythraea*, 16.V.1966, A. J. Bruce coll.: 1 ♂, 1 ♀ (LACM); Praslin I., *Seriatopora hystrix*, 20.II.1972: 4 ♂♂, 4 ♀♀ (MNHN-B 8223).
Aldabra. Main Channel, Royal Society Expedition, 10.XII.1967, J. D. Taylor coll.: 1 ♀ (BMNH).
Saya de Malha Bank. "Odissey", cr. 33, 12-13 m, 9.VI.1984: 3 ♂♂, 5 ♀♀ (ZMMU).
Comoro Is. Mayotte, 1903, M. Marie coll.: 1 ♂, 1 ♀ (MNHN-B 23071 bis).
Madagascar. Nosy Bé, September 1961, A. Crosnier coll.: 1 ♂, 1 ♀ (MNHN-B 23062); 10 m, January 1962: 4 ♂♂, 2 ♀♀ (MNHN-B 8221). — Tuléar, G. Grandidier coll.: 1 ♀ (MNHN-B 4344 part). — Tuléar, G. Petit coll.: 1 ♂, 1 ♀ (MNHN-B 23095); Tamatave: 1 ♂, 1 ♀ (MNHN-B 16892). —Tamatave,

J. Millot coll.: 1 ♂, 4 ♀♀ (MNHN-B 16887), 2 ♂♂, 1 ♀ (MNHN-B 23076).
La Réunion. *Pocillopora damicornis*, November 1977, S. Ribes coll.: 1 ♂, 1 ♀ (MNHN-B 8222); 1977: 1 ♂, 1 ♀ (MNHN-B 23063); outer reef slope, 40 m: 1 ♂, 1 ♀, 1 megalopa (MHNR-B 17). — La Saline, reef flat, 1 m, *P. damicornis*, 7.IX.1996, P. Castro & S. Ribes coll.: 1 ♂, 2 ♀♀ (MHNR-B 18); 9.IX.1996: 2 ♂♂, 6 ♀♀ (MHNR-B 19); Saint Gilles, reef flat, 1 m, *P. damicornis* & *P. verrucosa*, 11.IX.1996: 2 ♂♂, 1 ♀ (MHNR-B 20).
Mauritius. 1921, P. Carié coll.: 1 ♀ (MNHN-B 16526).
Maldives. Addu Atoll, "Xarifa", *Seriatopora*, 29.XII.1957, S. Gerlach coll.: 1 ♂, 3 ♀♀ (MNHN-B 13946), 5 ♂♂, 3 ♀♀ (MNHN-B 16915).
Chagos Archipelago. Salomon Is, Percy Sladen Trust Expedition, 20-28 m, 15.VI.1905: 1 ♂, 1 ♀ (USNM 41328); Egmont Is: 2 ♀♀ (USNM 41322). — Speakers Bank, "Odissey", cr. 33, 5°3.3'S - 72°15.2'E, 10-15 m, 18-21.VI.1984: 2 ♂♂, 3 ♀♀ (ZMMU).
Thailand (Andaman Sea). Phuket I., Tang Khen, 5.X.1990, T. Komai coll.: 1 ♂, 1 ♀ (CBM ZC 2396); Cape Phanwa, 9.X.1990: 1 ♂ (CBM ZC 2400).
Indonesia (Indian Ocean). Simeulue I., 2°27'N - 96°24'E, March 1913, E. Jacobson coll: 1 ♂, 1 ♀ (RMNH D 2101), 1 ♀ (RMNH D 47172). — Batu Is, Pulo Bai, "Te Vega", stn 101, 0°1'S - 98°31'E, 25.XI.1963: 1 ♀ (USNM). — Padang, August 1963: 1 ♂, 1 ♀ (MNHN-B 13289).
Cocos (Keeling) Is. 1941, C. A. Gibson-Hill coll.: 10 ♂♂, 6 ♀♀ (ZRC 1965.11.22.110-119), 2 ♂♂, 2 ♀♀ (ZRC 1970.7.13.3-12).
Christmas I. 1940, C. A. Gibson-Hill coll.: 1 ♂, 4 ♀♀ (ZRC 1970.7.13.67-72).

DISTRIBUTION. — Throughout the Indo-West Pacific region except the Persian Gulf and the Hawaiian Islands.

Trapezia lutea Castro, 1997

Trapezia lutea Castro, 1997a: 84, figs 2C, 2D, 3A–C, pl. 2C, pl. 5A (Kenya, Seychelles, Aldabra, îles Glorieuses, Madagascar, La Réunion, Mauritius, Maldives, Cocos [Keeling] Is, Western Australia).

? *Trapezia cymodoce* – Hilgendorf 1869: 76, pl. 2, fig. 5 (part) (Zanzibar). – Borradaile 1902: 265 (part) (Maldives).

Trapezia cymodoce – Laurie 1906: 410 (part) (Sri Lanka). – Rathbun 1911: 234 (part) (Chagos Archip.). – Bouvier 1915: 272 (part) (Mauritius). – Chen 1933: 106 (Sri Lanka). – Barnard 1950: 276 (part) (South Africa). – Tweedie 1950: 126 (part) (Cocos [Keeling] Is). – Garth 1971: 188 (part) (Maldives); 1974: 205 (part) (Maldives, Sri Lanka); 1984: 120 (part) (Seychelles). – Serène 1984: 272 (part) (Seychelles). Not *T. cymodoce* (Herbst, 1801).

MATERIAL EXAMINED. — **Kenya.** Ras Iwatine, 4°01'S - 39°44'E, 1 m, 26.II.1971, A. J. Bruce coll.: 1 ♂, 1 ♀ (BMNH), 1 ♂, 2 ♀♀ (BMNH); Mombasa I., 12.II.1972: 1 ♀ (MNHN-B 13337).
Seychelles. Mahé, 17.VI.1966, A. J. Bruce coll.: 2 ♂♂, 3 ♀♀ (LACM); Praslin I., 7 m, 17.II.1972: 3 ♂♂, 4 ♀♀ (MNHN-B 13335); baie Ste Anne: 1 ♂ (MNHN-B 13330), 1 ♀ (MNHN-B 25233); baie Curieuse, *Seriatopora hystrix*, 20.II.1972: 1 ♂, 2 ♀♀ (MNHN-B 23047); Mahé, Port Victoria, 15.II.1972: 1 ♂, 1 ♀ (MNHN-B 25232); Remire Reef, *Stylophora*, 12.II.1972: 1 ♂, 1 ♀ (MNHN-B 13336). — Reves 2 Expedition, stn 27, 4°55.6'S -54°58.5'E, 52 m, 8.IX.1980: 2 ♂♂, 3 ♀♀ (MNHN-B 11628). — Mahé, anse Nord d'Est, NIOP-E Tyro Expedition, stn 601, 4°34'S - 55°28'E, reef flat, 3 m, 5.XII.1992, C. Fransen coll.: 1 ♀ (RMNH D 47248); Mahé, south of Pte au Sel and île Souris, stn 603, 4°44'S - 55°32'E, reef flat, 2 m, 7.XII.1992: 1 ♂, 1 ♀ (RMNH D 47249); Mahé, North East Point, stn 604, 4°35'S - 55°28'E, reef flat and slope, 2-4 m, 8.XII.1992: 1 ♂, 2 ♀♀ (RMNH D 47250); Mahé, Port Launay National Park, stn 606, 4°38'S - 55°23'E, 3-6 m, 10.XII.1992: 1 ♂, 1 ♀ (RMNH D 47691); Mahé, cap Maçons/anse des Forbans, stn 612, 4°46'S - 55°31'E, reef flat, 12.XII.1992: 2 ♂♂, 2 ♀♀ (RMNH D 47252), reef flat and slope to 5 m, *Pocillopora verrucosa*: 1 ♂, 1 ♀ (RMNH D 47251); Aride I., stn 711, 4°13'S - 55°40'E, 18-19.XII.1992: 2 ♀♀ (RMNH D 47254); Poivre Atoll, stn 767, 5°44'S - 53°18'E, *P. damicornis*, 29-31.XII.1992: 1 ♂, 1 ♀ (RMNH D 47255); St. François Atoll, stn 792, 7°05'S - 52°44'E, outer slope to 27 m, transect 20, 5-6.I.1993: 1 ♂, 1 ♀ (RMNH D 47256), *P. eydouxi*, 1 ♂, 1 ♀ (RMNH D 47257); Mahé, îlot de l'Islette, stn 615, 4°40'S - 55°25'E, 2-5 m, 13.XII.1992, B. Hoeksema coll.: 1 ♂ (RMNH D 47253).
Aldabra. "Calypso", 1954: 2 ♂♂, 1 ♀ (MNHN-B 23060).
Astove I. 12 m, 27.II.1972, A. J. Bruce coll.: 2 ♂♂, 1 ♀ (MNHN-B 13332).
Farquhar Is. 12 m, 25.II.1972, A. J. Bruce coll.: 2 ♂♂, 3 ♀♀ (MNHN-B 13334).
Saya de Malha Bank. "Odissey", cr. 33, 9.VI.1984: 2 ♂♂, 3 ♀♀ (ZMMU). — "Vitiaz II", cr. 17, 20 m: 1 ♂ (ZMMU Ma-4472).
Îles Glorieuses. 10 m, January 1973, A. Crosnier coll.: 1 ♂, 3 ♀♀ (MNHN- B 23046).
Mozambique. Coconut Bay, 17.V.1973: 2 ♂♂, 1 ♀, 1 juv. (SAM A43246). — Magaruque, 23.V.1973: 1 ♂, 1 ♀, 1 juv. (SAM A43244); 25.V.1973, 1 ♂, 3 ♀♀ (SAM A43245).
South Africa. KwaZulu-Natal, Kosi Bay: 1 ♀ (BMNH 1917.6.19.47). — KwaZulu-Natal, Mtwalume, 26.XII.1938: 1 ♂, 1 ♀ (SAM A43247). — KwaZulu-Natal, Umpangazi, 25.IV.1967: 1 ♂, 4 ♀♀ (SAM A43248).

Madagascar. Tuléar, 1921, G. Petit coll.: 2 ♂♂, 2 ♀♀ (MNHN-B 23085). — Tamatave, 1880, De Lartigues coll.: 1 ♀ (MNHN-B 23089). — Tamatave, J. Millot coll.: 1 ♂ (MNHN-B 23086). — Port Dauphin: 2 ♂♂, 1 ♀ (MNHN-B 13331).
La Réunion. La Saline, outer reef slope, S. Ribes coll.: 1 ♂, 1 ♀ (MNHN-B 25247); 5 m: 1 ♀ (MNHN-B 8941); 10 m: 1 ♀ (MNHN-B 8943); 30 m, 18.XII.1976: 1 ♂, 1 ♀ (MNHN-B 8939); 15 m, *P. verrucosa*, 25.IX.1976: 1 ♀ (MHNR-B 21); 10 m, *P. verrucosa*, 24.VIII.1977: 1 ♂ (MHNR-B 22), 1 ♂ (MHNR-B 23). — La Saline, 16.IX.1982, M. de Saint Laurent coll.: 1 ♂ (MNHN-B 16547). — La Saline, reef flat, 1 m, *P. damicornis*, 7.IX.1996, P. Castro & S. Ribes coll.: 1 ♂ (MHNR-B 46); Saint Gilles, reef flat, 1 m, *P. verrucosa*, 11.IX.1996: 1 ♀ (MHNR-B 47), 1 ♀ (MHNR-B 48), 1 ♀ (MHNR-B 49), 1 ♂, 1 ♀ (MHNR-B 50), 1 ♂, 1 ♀ (MHNR-B 51), 1 ♂ (MHNR-B 52).
Mauritius. 1913, P. Carié coll.: 1 ♂, 1 ♀ (MNHN-B 16882), 1 ♀ (MNHN-B 23083), 15 ♂♂, 18 ♀♀ (MNHN-B 25380); 1914: 12 ♂♂, 20 ♀♀ (MNHN-B 23041); récif du Grand Port, 1913: 7 ♂♂, 5 ♀♀ (MNHN-B 23039), 21 ♂♂, 20 ♀♀ (MNHN-B 25360); Le Chaland, 28.IX.1912: 2 ♂♂, 7 ♀♀ (MNHN-B 25351); 1913: 2 ♂♂, 2 ♀♀ (MNHN-B 25344).
Maldives. Addu Atoll, "Xarifa", Seriatopora, 15 m, January 1958, S. Gerlach coll.: 2 ♂♂, 1 ♀ (MNHN-B 23044). —Miladummadulu Atoll, *Acropora*, 27.II.1964, J. S. Garth coll.: 1 ♂, 1 ♀ (LACM); Malé Atoll: 1 ♂, 1 ♀ (LACM); 18.III.1964: 1 ♂, 1 ♀ (LACM), 19.IV.1964: 1 ♂, 1 ♀ (LACM); 21.III.1964: 1 ♂, 1 ♀ (LACM).
Chagos Archipelago. Peros Banhos Is, Coin I., Percy Sladen Trust Expedition, 1905: 1 feminized ♂, 1 ♀ (USNM 41323); Salomon Is, 20-28 m, 15.VI.1905: 1 ♀ (USNM 41321); 7°21'35"S - 72°28'17"E, 0-2 m, 23.VI.1967: 1 ♀ (LACM). — Diego Garcia, "Vitiaz", cr. 35, 12.X.1962: 1 ♂, 1 ♀ (ZMMU Ma-2188). Speakers Bank, 10-15 m, "Odissey", cr. 33, 18-21.VI.1984: 12 ♂♂, 7 ♀♀ (ZMMU Ma-4412).
Sri Lanka. Galle, 5.III.1964, J. S. Garth coll.: 1 ♀ (LACM).
Cocos (Keeling) Is. 1945, C. A. Gibson-Hill coll.: 4 ♂♂, 6 ♀♀ (ZRC 1965.11.22.136-45). — V. Orr coll.: 2 ♂♂, 6 ♀♀ (LACM). — Flying Fish Cove, 10-15 m, 11.II.1987, G. Morgan coll.: 1 ♀ (WAM 600-87); North Keeling I., 17.II.1989: 1 ♂, 1 ♀ (WAM 701-89). — Home I., L. Marsh coll.: 1 ♂, 1 ♀ (WAM 836-89).
Christmas I. 1940, C. A. Gibson-Hill coll.: 2 ♂♂, 1 ♀ (ZRC 1970.7.13.27-32).
Western Australia. Kendrew I., Dampier Archip., 20.V.1974: 1 ♂, 1 ♀ (WAM 504-86).

DISTRIBUTION. — Throughout the Indo-West Pacific region except the Red Sea, Persian Gulf and the Hawaiian Islands.

REMARKS
The species was found in Indian Ocean material that was originally identified as *T. cymodoce*.
The smaller live individuals collected from La Réunion had small black granules throughout the carapace, giving it a darker, almost brown appearance. La Réunion individuals also showed a purple brown spot on the distal edge of the propodus of the walking legs, which has not been observed in western Pacific Ocean populations. As in live individuals from the western Pacific, the tomentum on the chelipeds was either transparent, green or light to dark red brown. A tomentum was also found on the walking legs of some individuals, especially small ones.

Trapezia punctipes Castro, 1997

Trapezia punctipes Castro, 1997a: 87, fig. 4, pl. 2D.

MATERIAL EXAMINED. — **Thailand (Andaman Sea).** Phuket I., Cape Phanwa & Makham Bay, 25-26.VIII.1980, P. Castro coll.: 3 ♂♂, 3 ♀♀ (colour photographs).

DISTRIBUTION. — Recorded so far from the Andaman Sea, Indonesia (Celebes and Moluccas Islands), Saipan, Belau, eastern Australia and Fiji (see Castro 1999).

Trapezia richtersi Galil *et* Lewinsohn, 1983

Trapezia sp. – Richters 1880: 152, pl. 16, fig. 13 (Mauritius).

Trapezia richtersi Galil *et* Lewinsohn, 1983: 160, figs 1-4 (Somalia, Kenya, Seychelles, Aldabra, Mauritius). – Serène 1984: 274, fig. 181, pl. 39E (Seychelles, Mauritius).

Trapezia rufopunctata – Miers 1884b: 536 (part) (Seychelles). Not *T. rufopunctata* (Herbst, 1799).

Trapezia ferruginea var. *intermedia* – Alcock 1898: 220 (part) (Andaman Sea). – Sankarankutty 1962: 148 (Andaman Is). Not *T. intermedia* Miers, 1886.

Trapezia cymodoce intermedia – Rathbun 1911: 235 (Seychelles).

Trapezia rufopunctata forme *typica* – Bouvier 1915: 271 (part) (Mauritius).

Trapezia ferruginea forme *maculata* – Bouvier 1915: 272 (part) (Mauritius).

Trapezia maculata – Gravier 1920: 470 (part) (Madagascar).

Trapezia aff. *danai* – Serène 1971: 136, figs 14B, 15, 16, 21, 22, 24 (part) (Mauritius). – Garth 1974: 205 (Maldives, Sri Lanka).

Trapezia danai – Serène 1977: 51 (Seychelles).

Trapezia intermedia – Türkay 1981: 59 (Mauritius).

?*Trapezia* sp. ("fine-dotted") – Garth 1984: 120 (Seychelles).

MATERIAL EXAMINED. — **Seychelles.** Praslin I., Percy Sladen Trust Expedition, 1905: 1 ♀ (USNM 41331). — Praslin I., baie Ste Anne, 17.II.1972, A. J. Bruce coll.: 1 ♂ (MNHN-B 8244). — Reves 2 Expedition, stn 27, 4°55.6'S - 54°58.5'E, 52 m, 8.IX.1980: 2 ♀♀ (MNHN-B 11630), 1 ♂ (MNHN-B 20662). — Deroche I., "Akademik Petrovsky", cr. 14, 21-24.XII.1983: 1 ♂ (ZMMU Ma-4479). — Mahé, North East Point, NIOP-E Tyro Expedition, stn 604, 4°35'S - 55°28'E, reef flat and slope, 2-4 m, 8.XII.1992, C. Fransen coll.: 1 ♂, 1 ♀ (RMNH D 47258); Mahé, cap Maçons/anse des Forbans, stn 612, 4°46'S - 55°31'E, reef flat, under rocks, 12.XII.1992: 1 ♂ (RMNH D 47259), reef flat and slope to 5 m, *Pocillopora verrucosa*, 1 ♀ (RMNH D 47260); Platte Atoll, stn 797, 5°49'S - 55°21'E, 12 m, 7.I.1993: 1 ♂, 1 ♀ (RMNH D 47261).
Aldabra. Gros Îlot, Royal Society Expedition, 14.X.1967, J. D. Taylor coll.: 1 ♂, 1 ♀ (BMNH); Passe Dubois, 18.X.1967: 1 ♂, 1 ♀ (BMNH).
Farquhar Is. 15 m, 25.II.1972, A. J. Bruce coll.: 1 ♂ (MNHN-B 8243).
Madagascar. Nosy Komba, 5 m, October 1960, A. Crosnier coll.: 1 ♀ (MNHN-B 16919). — Tamatave, J. Millot coll.: 1 ♂, 2 ♀♀ (MNHN-B 16511), 1 ♂ (MNHN-B 16614). — Diego Suarez, May 1919, R. Decary coll.: 1 ♂, 2 ♀♀ (MNHN-B 23069).
La Réunion. Outer reef slope, 30 m, 5.XI.1976, S. Ribes coll.: 1 ♂, 1 ♀ (MNHN-B 13932); 10 m, 1977: 1 ♂, 1 ♀ (MNHN-B 13928), 1 ♂, 1 ♀ (MNHN-B 13929); 20 m, 1977: 2 ♂♂, 2 ♀♀ (MNHN-B 13931); 40 m, *P. damicornis*, 6.VIII.1977: 1 ♂ (MNHN-B 13934); 10 m, 18.VIII.1977: 1 ♀ (MNHN-B 13930); 30 m, 3.X.1977: 1 ♂, 1 ♀ (MNHN-B 13933); La Saline, 10 m, *P. verrucosa*: 1 ♂ (MHNR-B 4); 5 m: 1 ♂, 1 ♀ (MHNR-B 5); 30 m, *Stylophora mordax*, 14.XII.1976: 1 ♂, 1 ♀ (MHNR-B 6); 15 m, *P. eydouxi*: 2 ♂♂, 1 ♀ (MHNR-B 7). — La Saline, reef flat, 1 m, *P. damicornis*, 7.IX.1996, P. Castro & S. Ribes coll.: 1 ♀ (MHNR-B 1); *P. brevicornis*, 9.IX.1996: 2 ♂♂, 2 ♀♀ (MHNR-B 3); outer reef slope, 20 m, 8.IX.1996: 7 ♂♂, 9 ♀♀ (MHNR-B 2).
Mauritius. 1913, P. Carié coll.: 1 ♂, 1 ♀ (MNHN-B 16610), 1 ♂ (MNHN-B 16611), 2 ♂♂ (MNHN-B 16612), 1 ♂, 1 ♀ (MNHN-B 23040); récif du Grand Port, 1913: 4 ♂♂, 3 ♀♀ (MNHN-B 16613), 5 ♂♂, 3 ♀♀ (MNHN-B 25346), 2 ♂♂, 10 ♀♀ (MNHN-B 25358); Le Chaland, 1913: 1 ♂, 1 ♀ (MNHN-B 23068), 2 ♂♂, 5 ♀♀ (MNHN-B 23093), 8 ♂♂, 13 ♀♀ (MNHN-B 25343).
Thailand (Andaman Sea). Phuket I., Makham Bay, 26.VIII.1980, P. Castro coll.: colour photographs. — Phuket I., Cape Phanwa, 20.X.1990, T. Komai coll.: 1 ♂, 1 ♀ (CBM ZC 2248).

DISTRIBUTION. — Known only from the western Indian Ocean (Somalia to Madagascar) to the Andaman Sea.

Trapezia rufopunctata (Herbst, 1799)

Cancer rufopunctatus Herbst, 1799: 54, pl. 47, fig. 6.

Grapsillus maculatus MacLeay, 1838: 67 (South Africa).

Trapezia rufopunctata – Hilgendorf 1869: 75, pl. 2, fig. 3 (part) (Zanzibar). – Miers 1884b: 536 (part) (îles Glorieuses). – Henderson 1893: 336, 366 (India, Sri Lanka). – Ortmann 1894: 54 (Tanzania). – Alcock 1898: 222 (Sri Lanka). – Borradaile 1902: 265 (Maldives). – Calman 1909: 705 (Christmas I.). – Rathbun 1911: 235 (Chagos Archip.). – Chen 1933: 110 (Sri Lanka). – Ward 1942b: 99 (Chagos Archip.). – Barnard 1950: 278 (Mozambique). – Tweedie 1950: 126 (Cocos [Keeling] Is). – Michel 1964: 31 (Mauritius). – Serène 1977: 51 (Seychelles); 1984: 276, fig. 184, pl. 39A (Seychelles, Comoro Is). – Galil & Lewinsohn 1985: 209, figs 1-6 (Somalia, Seychelles, îles Glorieuses, Madagascar, Maldives, Sri Lanka, Chagos Archip.). – Kalk 1995: 228 (Mozambique) – Jones 1997: 234, unnumb. fig. (eastern Indian Ocean).

?*Trapezia rufopunctata* – Wedenissow 1894: 413 (Somalia). – Vatova 1943: 22 (Somalia).

Trapezia rufopunctata forme *typica* – Bouvier 1915: 273 (part) (Mauritius).

Trapezia rufopunctata var. *maculata* – Guinot 1962a: 240 (part) (Maldives).

Trapezia aff. *maculata* – Serène 1971: 130, figs 2, 6, 10, 13A, 13B (Maldives, Sri Lanka).

Trapezia maculata – Serène 1984: 277, pl. 39B (Seychelles). – Tsareva, 1980: 119 (Wesrern Australia).

MATERIAL EXAMINED. — **Kenya.** Mombasa, 26.I.1974, J. Wood coll.: 1 ♂ (MNHN-B 16822).
Seychelles. Praslin I., 17.II.1972, A. J. Bruce coll.: 1 ♂, 1 ♀ (MNHN-B 8262); baie Ste Anne, 19.II.1972: 1 ♂, 1 ♀ (MNHN-B 8261). — Reves 2 Expedition, stn 27, 4°55.6'S - 54°58.5'E, 52 m, 8.IX.1980: 2 ♀♀ (MNHN-B 11629). — Mahé, NIOP-E Tyro Expedition, stn 612, 4°46'S - 55°33'E, 10 m, *Pocillopora verrucosa*, 24.XII.1992, C. Fransen coll.: 1 ♀ (RMNH D 47262); Aride I., stn 711,

4°13'S - 55°40'E, *P. verrucosa*, 18-19.XII.1992: 1 ♂ (RMNH D 47263); île Desnœufs, stn 783, 6°12'S - 53°02'E, *P. eydouxi*, reef slope to 10 m, 2.I.1993: 1 ♀ (RMNH D 47264).
Comoro Is. Mayotte, 10 m, September 1959, A. Crosnier coll.: 1 ♀ (MNHN-B 8260).
Îles Glorieuses. "Alert", stn 219, 14-20 m, R. W. Coppinger coll.: 1 ♂ (BMNH 1882.24).
Mozambique. Coconut Bay, 17.V.1973: 2 ♂♂ (SAM A43249).
South Africa. Eastern Cape Province, Mbotye, 13.VII.1956: 1 ♂ (SAM A39647).
Madagascar. Tamatave, 1880, De Lartigues coll.: 1 ♂, 1 ♀ (MNHN-B 23072); 1905: 1 ♂ (MNHN-B 16541).
Mauritius. 2 ♂♂ (MNHN-B 16532). — 1913, P. Carié coll.: 1 ♂, 1 ♀ (MNHN-B 16528); récif du Grand Port: 3 ♀♀ (MNHN-B 25347).
Maldives. Addu Atoll, "Xarifa", 9 m, *Seriatopora*, 30.XII.1957, S. Gerlach coll.: 1 ♂ (MNHN-B 16529); 15 m, January 1958: 2 ♂♂ (MNHN-B 16530).
Chagos Archipelago. Salomon Is, Percy Sladen Trust Expedition, 1905: 1 ♂, 1 ♀ (USNM 41334); Egmont Is: 1 ♂ (USNM 41333).
Christmas I. 1940, C. A. Gibson-Hill coll.: 2 ♂♂ (ZRC 1970.7.13.49-50).
Cocos (Keeling) Is. 1941, C. A. Gibson-Hill coll.: 1 ♂ (ZRC 1965.11.22.124), 4 ♂♂, 2 ♀♀ (ZRC 1970.7.13.39-48).

DISTRIBUTION. — Throughout the Indo-West Pacific region except the Red Sea and the Persian Gulf.

REMARKS

The type locality of *T. rufopunctata* was not given in its description (Herbst 1799). Galil (1984) presents evidence that *Grapsillus maculatus* MacLeay, 1838 is a junior synonym of *T. rufopunctata*, not of *T. tigrina* Eydoux *et* Souleyet, 1842.

Trapezia septata Dana, 1852

Trapezia septata (var.) Dana, 1852b: 260.

Trapezia areolata – Heller 1865: 25, 256, 261 (Nicobar Is). – Henderson 1893: 336, 366 (Sri Lanka). – Tweedie 1950: 126 (Cocos [Keeling] Is). – Sankarankutty 1966a: 351, 360 (India). – Garth 1974: 205 (Sri Lanka). – Lundoer 1974: 7 (Andaman Sea). – Tsareva 1980: 120 (Western Australia). – Black & Prince 1983: 140 (Western Australia). Not *T. areolata* Dana, 1852.

Trapezia ferruginea var. *areolata* – Alcock 1898: 221 (Sri Lanka, Andaman Sea, Andaman Is, Nicobar Is). – Laurie 1906: 410 (Sri Lanka). – Calman 1909: 705 (Christmas I.). – Gravely 1927: 144 (India). – Chen 1933: 109 (Sri Lanka). – Chopra & Das 1937: 410 (Andaman Sea). – Sankarankutty 1962: 148 (Andaman Is).

Trapezia septata – Galil 1985: 288, figs 2, 5, 6 (Sri Lanka). – Morgan 1990: 52 (Western Australia).

MATERIAL EXAMINED. — **Thailand (Andaman Sea).** Phuket I., Cape Phanwa & Makham Bay, 25-26.VIII.1980, P. Castro coll.: colour photographs. — Phuket I., Cape Phanwa, 18.X.1990, T. Komai coll.: 3 ♂♂, 4 ♀♀ (CBM ZC 2344).
Cocos (Keeling) Is. 1941, C. A. Gibson-Hill coll.: 5 ♂♂, 3 ♀♀ (ZRC 1965.11.22.49-56), 1 ♂, 1 ♀ (ZRC 1978.7.14.1-2).

DISTRIBUTION. — Known only from the northeastern Indian Ocean (Sri Lanka to Western Australia) to the Pacific Ocean (Japan to Samoa).

Trapezia speciosa Dana, 1852

Trapezia speciosa Dana, 1852a: 83. – Richters 1880: 151, pl. 16, figs 9-12 (Mauritius). – Türkay 1981: 59 (Mauritius). – Serène 1984: 278, fig. 186, pl. 38E (La Réunion). – Castro 1997b: 129, pl. 1F (Seychelles, La Réunion).

Trapezia digitalis forme *speciosa* – Bouvier 1915: 273 (Mauritius).

Trapezia digitalis speciosa – Michel 1964: 31 (Mauritius).

MATERIAL EXAMINED. — **Seychelles.** Praslin I., 17.II.1972, A. J. Bruce coll.: 2 ♂♂, 1 ♀ (MNHN-B 23048).
La Réunion. Outer reef slope, 5 m, S. Ribes coll.: 1 ♂, 1 ♀ (MNHN-B 16093); 5 m: 2 ♂♂, 1 ♀ (MNHN-B 25305), 1 ♀ (MNHN-B 25311), 1 ♂ (MHNR-B 27); 10 m: 1 ♂ (MNHN-B 25307); *Pocillopora damicornis*, 5 m: 1 ♂, 1 ♀ (MHNR-B 28); *P. eydouxi*: 2 ♂♂, 1 ♀ (MNHN-B 25302); 15 m, *P. eydouxi*, 30.IX.1976: 1 ♂, 1 ♀ (MHNR-B 29); 30 m, *Stylophora*, 25.XI.1976: 1 ♂, 1 ♀ (MNHN-B 8328); 5 m, 28.XI.1976: 2 ♀♀ (MNHN-B 8327); 28.XII.1976: 1 ♂, 1 ♀ (MNHN-B 25310); 20 m, 13.III.1977: 1 ♂ (MNHN-B 25308); La Saline, 5 m, *Stylophora*: 2 ♂♂, 1 ♀ (MNHN-B 25304); 20 m, *S. mordax*: 1 ♂, 1 ♀ (MNHN-B 8326); 5 m, 1977: 2 ♂♂ (MNHN-B 25309); *Stylophora*, 24.I.1977: 1 ♀ (MNHN-B 25303); 10 m, 18.VIII.1977: 2 ♂♂, 1 ♀ (MNHN-B 25306). — M. Peyrot-Clausade coll.: 1 ♀ (MNHN-B 25301). — Saint Gilles, reef flat, 17.IX.1982, M. de Saint Laurent coll.: 4 ♂♂, 4 ♀♀ (MHNR-B 30). — La Saline, outer reef slope, 20 m, *P. brevicornis*, 8.IX.1996, P. Castro & S. Ribes coll.:

4 ♂♂, 4 ♀♀ (MHNR-B 31); Saint Gilles, reef flat, 1 m, *P. damicornis*, 11.IX.1996: 4 ♂♂, 4 ♀♀ (MHNR-B 32).
Mauritius. Récif du Grand Port, 1913, P. Carié coll.: 1 ♂ (MNHN-B 25348).
Chagos Archipelago. Diego Garcia, South Point, Royal Society Expedition, 11.VII.1967, J. D. Taylor coll.: 2 ♂♂, 3 ♀♀ (BMNH 1969. 1174. 5).

DISTRIBUTION. — Only known from the western and central Indian Ocean (Seychelles to the Chagos Archipelago) and the Pacific Ocean (South China Sea to French Polynesia).

Trapezia tigrina Eydoux *et* Souleyet, 1842

Cancer rufopunctatus – Rüppell 1830: 27 (Red Sea). Not *T. rufopunctata* (Herbst, 1799).

Trapezia tigrina Eydoux *et* Souleyet, 1842: 232, pl. 2, fig. 4. – Serène 1984: 275, fig. 182, pl. 39C, D (Red Sea, Seychelles, Mauritius). – Galil & Lewinsohn 1984: 166 (Red Sea, Aden, Somalia, Seychelles, Maldives). – Galil 1988b: 167, fig. 5 (Red Sea). – Hogarth 1989: 106 (Oman); 1994: 103 (Oman).

Trapezia rufopunctata – Heller 1861a: 13 (Red Sea); 1861b: 348, 350 (Red Sea). – Milne Edwards 1868: 71 (Zanzibar). – Hilgendorf 1869: 75, pl. 2, fig. 3 (part) (Zanzibar). – Kossmann 1877: 44 (Red Sea). – De Man 1880: 176 (Red Sea); 1881: 94 (Red Sea). – Miers 1884b: 536 (part) (Seychelles). – Klunzinger 1913: 309, pl. 7, fig. 13 (Red Sea). – Garth 1971: 188 (Maldives). Not *T. rufopunctata* (Herbst, 1799).

? *Trapezia punctata* Coulon, 1864: 569 (Red Sea).

Trapezia ferruginea var. *rufopunctata* – Paulson 1875: 7, 54, 57, pl. 7, figs 3, 3a (Red Sea).

Trapezia maculata – Henderson 1893: 336, 366 (Sri Lanka). – Alcock 1898: 221 (Andaman Is). – Nobili 1901: 16 (Red Sea); 1905: 10 (Tanzania); 1906b: 293 (Red Sea, Gulf of Aden). – Gravier 1920: 470 (part) (Madagascar). – Balss 1924: 13 (Red Sea). – Pesta 1928: 72 (Red Sea). – Ramadan 1936: 35 (Red Sea). – Monod 1938: 142 (Red Sea). – Stella 1953: 65 (Red Sea). – Sankarankutty 1961: 130 (Laccadive Is).

Trapezia ferruginea var. *maculata* – Borradaile 1902: 265 (Maldives).

? *Trapezia maculata* – Lenz 1905: 351, 390 (Aldabra). – Laurie 1906: 410 (Sri Lanka). – Stebbing 1910: 304 (South Africa).

? *Trapezia ferruginea maculata* – Lenz 1910: 553 (Europa I.).

Trapezia cymodoce maculata – Rathbun 1911: 235 (Chagos Archip.).

Trapezia ferruginea maculata – Lenz 1912: 4 (Red Sea). – Michel 1964: 31 (Mauritius).

Trapezia ferruginea forme *maculata* – Bouvier 1915: 272 (part) (Mauritius).

Trapezia cymodoce var. *maculata* – Laurie 1915: 415, 462 (Red Sea).

Trapezia guttata – Barnard 1950: 277 (Mozambique). Not *T. guttata* Rüppell, 1830.

Trapezia rufopunctata var. *maculata* – Chen 1933: 110 (Sri Lanka). – Guinot 1962a: 240 (part) (Maldives).

Trapezia aff. *danai* – Serène 1971: 136, fig. 14A (part) (Maldives ?). – Tsareva 1980: 119 (Western Australia).

Trapezia wardi Serène, 1971: 140, figs 7, 8, 11, 12, 17, 18, 19, 20, 23, 25 (Red Sea, Mauritius, Maldives, Sri Lanka). – Edwards & Emberton 1980: 237 (Red Sea).

Trapezia aff. *maculata* – Garth 1974: 205 (Maldives).

Trapezia aff. *wardi* – Garth 1974: 205 (Maldives, Sri Lanka); 1984: 120 (Seychelles).

Trapezia aff. *tigrina* – Garth 1974: 205 (Sri Lanka).

MATERIAL EXAMINED. — **Red Sea.** No location: 1 ♀ (MNHN-B 2964). — Jiddah, M. Botta coll.: 1 ♂, 2 ♀♀ (MNHN-B 2962). — Hofun, 1929, E. Ninni coll.: 1 ♂ (MNHN-B 23058). — Jubal, 20.XI.1928, R. Dollfus coll.: 1 ♂, 1 ♀ (MNHN-B 8348); 29.XII 1928: 1 ♀ (MNHN-B 16510). — "Calypso", 1952: 1 ♀ (MNHN-B 8288); Abu Lat I.: 1 ♀ (MNHN-B 16545), 4 ♂♂, 2 ♀♀ (MNHN-B 16534). — Port Sudan, August-September 1978, H. Emberton coll.: 1 ♂ (RMNH D 47328). — Dahlak Archip., "Akademik Petrovsky", cr. 14, 28.I.1984: 2 ♀♀ (ZMMU Ma-4468).
Gulf of Aden. Djibouti, 1897, H. Coutière coll.: 3 ♂♂, 4 ♀♀, 1 juv. (MNHN-B 16514). — Obock, 1897, F. Jousseaume coll.: 1 ♀ (MNHN-B 16515). — Musha I., 27.I.1904, C. Gravier coll.: 1 ♀ (MNHN-B 25342). — Aden, Simon coll.: 1 ♂ (MNHN-B 16533). — Aden, L. M. McCormick coll.: 2 ♀♀ (USNM). — Sikha I., "Akademik Petrovsky", cr. 14, 29.XI.1983: 2 ♂♂ (ZMMU Ma-4491). — "Odissey", cr. 34, 13°59.5'N - 48°24.7'E, 3-5 m, 23.IV.1985: 1 ♂, 2 ♀♀ (ZMMU Ma-4435).
Oman. *Pocillopora damicornis*, P. W. Glynn coll.: 2 ♀♀, 1 juv. (LACM); off Christian Cemetery, 28.IX.1982: 3 ♂♂, 1 ♀ (LACM).
Persian Gulf. Hormuz, 25°56.5'N - 56°28.2'E, 10-25 m, *P. damicornis*, 29.VI.1995, M. Apel coll.: 1 ♂, 1 ♀ (SMF 24081); 25°49'N - 56°28.2'E, 3-15 m: 1 ♂ (SMF 24082).
Somalia. Near Berbera, "Akademik A. Kovalevsky", 19.IX.1962: 2 ♂♂, 3 ♀♀ (ZMMU Ma-2233).
Kenya. Bambuni Beach, 19-26.XI.1969, L.B. Holthuis coll.: 1 ♀, 1 juv. (RMNH D 47329).
Tanzania. Zanzibar, G. Grandidier coll.: 1 ♂

(MNHN-B 2966), 1 ♀ (MNHN-B 2965). — Zanzibar, A. J. Bruce coll.: 1 ♀ (RMNH D 34988).
Seychelles. No location, 1972, A. J. Bruce coll.: 2 ♂♂, 2 ♀♀ (MNHN-B 8246). — Reves 2 Expedition, stn 27, 4°56.6'S - 54°58.5'E, 52 m, 8.IX.1980; 3 ♂♂, 2 ♀♀ (MNHN-B 11631).
Saya de Malha Bank. "Odissey", cr. 33, 12-13 m, 9.VI.1984: 2 ♂♂, 1 ♀ (ZMMU). — "Vitiaz II", cr. 17, 20 m; 2 ♂♂ (ZMMU Ma-4478).
Mozambique. Lourenço Marques [= Maputo], June 1920: 1 ♂, 1 ♀ (SAM A43243). — Delagoa [= Lourenço Marques] Bay, 1912: 2 ♀♀ (SAM A8331). — Jangamo, July 1968: 1 ♀ (SAM A13515).
Madagascar. Diego Suarez, May 1919, R. Decary coll.: 2 ♂♂ (MNHN-B 16513). — Tamatave, October 1880, De Lartigues coll.: 1 ♂, 2 ♀♀ (MNHN-B 23091).
La Réunion. La Saline, outer reef slope, 10 m, S. Ribes coll.: 1 ♂, 1 ♀ (MNHN-B 23050); 5 m, *P. eydouxi*: 1 ♂, 1 ♀ (MHNR-B 24).
Mauritius. P. Carié coll.: 1 ♀ (MNHN-B 23054); 1913: 1 ♂, 3 ♀♀ (MNHN-B 8245), 1 ♂, 1 ♀ (MNHN-B 8247), 1 ♂, 1 ♀ (MNHN-B 16509), 1 ♂ (MNHN-B 16609); 1914: 1 ♂, 1 ♀ (MNHN-B 23043); récif du Grand Port, 1913: 1 ♂ (MNHN-B 16536), 1 ♂ (MNHN-B 16611), 11 ♂♂, 9 ♀♀ (MNHN-B 25345); Le Chaland, 1913: 1 ♂ (MNHN-B 16512).
Maldives. Addu Atoll, "Xarifa", S. Gerlach coll.: 1 ♂, 1 ♀ (MNHN-B 16535); January 1958: 3 ♀♀ (MNHN-B 23051). — Male Atoll, 21.III.1964, J. S. Garth coll.: 1 ♂, 1 ♀ (LACM).
Chagos Archipelago. Diego Garcia, 1.5 m, "Vitiaz", cr. 35, 12.X.1962: 1 ♂ (ZMMU Ma-2197).
Nicobar Is. Galathea Expedition: 1 ♀ (USNM).

DISTRIBUTION. — Throughout the Indo-West Pacific region except the Coral Sea and the Hawaiian Islands.

BIOGEOGRAPHY

Most Indian Ocean and Red Sea species of *Quadrella*, *Tetralia*, *Tetraloides* and *Trapezia* are widely distributed across the Indo-West Pacific region. Three of these, *Trapezia digitalis*, *T. formosa* and *T. ferruginea*, even reach into the eastern Pacific region. The only species of these genera that are endemic to the Indian Ocean are *Tetralia cavimana*, which is restricted to the Red Sea and the northwestern Indian Ocean, and *Trapezia richtersi*, known only from the Indian Ocean as far east as the Andaman Sea. Very few species (one of *Quadrella*, two of *Trapezia* and one of *Tetralia*) and no endemics are so far known from the Persian Gulf, one of the few marginal regions of the Indian Ocean. In contrast, peripheral endemism is more common in the Pacific Ocean. Four species of *Trapezia* seem to be endemic to southeastern Polynesia (Castro 1997b), one to the Hawaiian Islands and the north-central Pacific (Castro 1998a) and one to the eastern Pacific (Castro 1996).

Some colour variations exist when Indian Ocean populations of some of the species are compared to populations of the same species from the Pacific. Although morphologically identical, these populations may prove to be geographically isolated gene pools.

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First neotropical record of the genus *Hormopeza* Zetterstedt, 1838 (Diptera, Empididae)

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Hormopeza,
new species,
neotropical region.

ABSTRACT

The genus *Hormopeza* Zetterstedt (Empididae, Oreogetoninae) is recorded for the first time from the neotropical region, with the description of a new species, *Hormopeza dureti* n.sp., from Brazil. This species is defined by the combination of the following male characters: the eyes are dichoptic with face broader than frons, the epandrial lamellae are formed of two characteristic processes, a single membranous processus arises from between postgonites, and the apical filament of phallus is short. A narrow relationship between the three southern hemisphere species known now is inferred on the basis of the presence of dichoptic eyes in the male.

MOTS CLÉS
Diptera,
Empididae,
Hormopeza,
nouvelle espèce,
région néotropicale.

RÉSUMÉ

Première mention néotropicale du genre Hormopeza *Zetterstedt, 1838 (Diptera : Empididae).*

Le genre *Hormopeza* Zetterstedt (Empididae, Oreogetoninae) est pour la première fois répertorié en région néotropicale, et une espèce nouvelle provenant du Brésil, *Hormopeza dureti* n.sp., est décrite. Cette espèce est définie par la combinaison des caractères mâles suivants : les yeux sont dichoptiques, avec la face plus large que le front, les lamelles épandriales sont formées de deux processus caractéristiques, un unique processus membraneux est présent entre les postgonites, et le filament apical du phallus est court. Une relation de parenté étroite entre les trois espèces de l'hémisphère sud à présent connues est supposée par la présence d'yeux dichoptiques chez le mâle.

INTRODUCTION

The genus *Hormopeza* Zetterstedt, 1838, was previously known from the Nearctic, Palearctic and Oriental regions (Frey 1953; Melander 1965; Steyskal 1969; Chvála & Wagner 1989; Smith 1975) with nine recognized species, of which two are Holarctic in distribution. Recently, Sinclair (1995a) added two southern hemisphere species respectively from South Africa (Natal) and Australia (Tasmania) (see Appendix). I add here a twelfth species, *Hormopeza dureti* n.sp., from Brazil (Minas Gerais).

Species of *Hormopeza* are commonly recognized by the particular shape of the third segment of the antenna; the first flagellomere being very broad with a short style (Collin 1961 ; Sinclair 1995a, b); this style bearing a further apical segment present as a small bristle. An apical bristle-like segment is also found in other Empidoidea (*e.g.* in the tribe Hilarini and the genera of the *Dryodromia* group). Unfortunately, the antennae of the single male specimen from Brazil are missing, but the combination of the following characters allows assignment of this species to *Hormopeza*: the wing venation (R_{4+5} forked with R_4 and R_5 strongly divergent, the obtuse junction of CuA_2 and A_1, and the slightly sclerotized veins on the posterior half of the wing, *e.g.* see Collin 1961, fig. 105), the absence of the tarsal claws of fore legs (Collin 1961 ; Sinclair 1995a) and the structure of male genitalia (Fig. 1), especially the presence of postgonites (Fig. 1B, C) and a phallus ending in an apical filament (Sinclair 1995a, b; Fig. 1C).

MATERIALS AND METHODS

The single male of *Hormopeza dureti* n.sp. was found in the Neotropical Duret collection recently acquired by the Muséum national d'Histoire naturelle, Paris (MNHN). The specimen is glued to a piece of cardboard.

The morphological terms follow McAlpine (1981), except for the male genitalia for which the homologies and terms of Sinclair (1996), Sinclair *et al.* (1994) and Cumming *et al.* (1995) are preferred. Since the epandrium of the Empidoidea is deeply cleft mediodorsally, the term of epandrial lamella for the lateral sclerites of the epandrium is used (Daugeron 1997a).

The male genitalia were macerated in hot 10% KOH. Chlorazol black was used to stain some parts of hypopygium. Specimens were drawn in glycerin using a camera lucida.

SYSTEMATICS

Hormopeza dureti n.sp.
(Fig. 1)

TYPE MATERIAL. – Holotype ♂ [red label], Christophe Daugeron dét., 1998, Brésil, Minas Gerais, Ing. Dolabella réc., 13.V.1964 (MNHN, Duret collection, 788: 93).

DISTRIBUTION. — Brazil (Minas Gerais).

ETYMOLOGY. — The species is dedicated to Dr Pedro Duret.

MALE DESCRIPTION

Head

Occiput dark grey with pair of distinct yellowish paravertical bristles. Ocellar triangle prominent with only bristly hairs. Pedicel and flagellum of antennae missing, scape very short. Proboscis very short, oblique, palpi lighter than labella. Eyes dichoptic but face broader than frons, facets all of equal size.

Thorax

Dusted greyish to blackish, all bristles brownish to yellowish. Prosternum and proepisternum not fused, consequently prosternum small, isolated between the front coxae. Postpronotum with at least two distinct rather strong and long bristles. Acrostichals biserial, short. Dorsocentrals irregularly biserial, a little longer than acrostichals, ending with long, strong prescutellar bristle. Several short presutural intraalars. One strong, rather long presutural supraalar. Three strong, long notopleurals. Scutellum with two pairs of strong, long, apical bristles, two pairs of shorter, lateral bristles and fringe of very short bristles. Laterotergite bare.

Legs

Hindlegs missing on the type specimen. Coxae blackish to brownish in the lower part, with distinct yellow bristles anteriorly. Femora, tibiae and tarsi blackish to brownish, somewhat shining, covered with numerous very short bristles or bristly hairs. Tibiae with some bristles distinctly stronger and longer. Pulvilli distinct, tarsal claws of forelegs absent.

Wings

Hyaline, veins brownish to yellowish on anterior half of wing, becoming faintly sclerotized and thus very faint on posterior half. All veins complete except A_1, indistinct towards the margin of wing. R_{4+5} forked with R_4 and R_5 strongly divergent and R_4 almost invisible at base. Costa ending at R_5. Anal lobe well developed with right angled. One halter not visible, second one broken.

Abdomen

Greyish dusted at base, otherwise shining blackish with distinct yellowish bristles on lateral and hind margins of segments, especially in the anterior part of abdomen. Tergite 8 desclerotized mediolaterally.

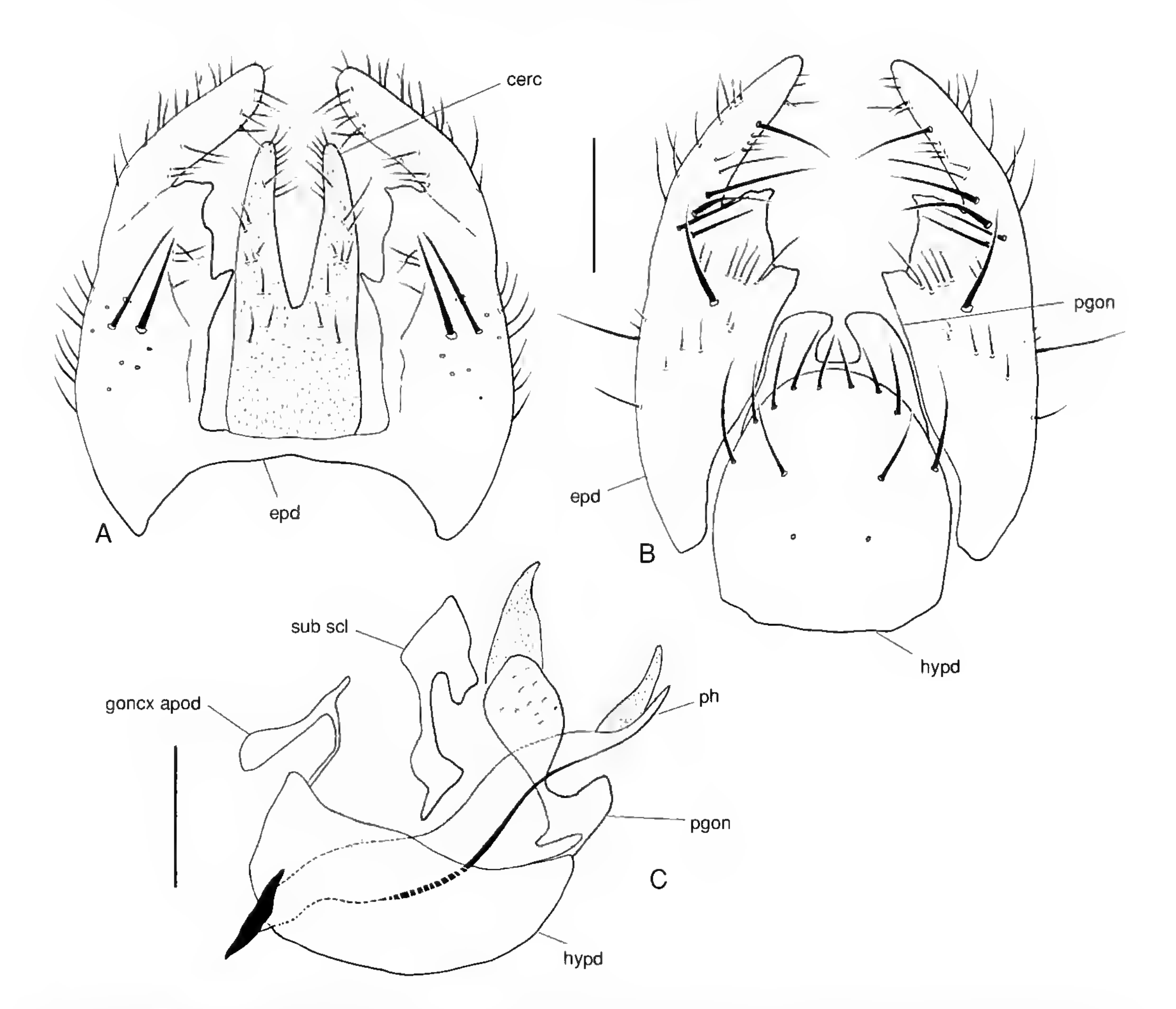


FIG. 1. — Male hypopygium of *Hormopeza dureti* n.sp. **A**, dorsal view; **B**, ventral view; **C**, lateral view. Abbreviations: **cer**, cercus; **epd**, epandrium; **goncx apod**, gonocoxal apodeme; **hypd**, hypandrium; **pgon**, postgonites; **ph**, phallus; **sub scl**, subepandrial sclerite. Scale bar: 0.2 mm.

Hypopygium (Fig. 1)
Cerci long, almost unsclerotized and bearing some fine and short bristly hairs especially at the apex (Fig. 1A). Epandrium not paired but deeply cleft mediodorsally, each lateral epandrial lamella formed of two processes, the first one long, the second one shorter, respectively rounded and pointed apically (Fig. 1A, B). Hypandrium with fringe of distinct, rather long bristles on apical margin (Fig. 1B), postgonites perpendicular to the hypandrial plate, arising from between them, a single membranous process (Fig. 1C). Phallus rather short, with short apical filament (Fig. 1C).

Female unknown.

DISCUSSION

Although the genus *Hormopeza* is rarely collected, especially in the southern hemisphere, its presence in the Neotropical region allows to recognize it as distributed worldwide.
In the male of *H. dureti*, the tarsal claws of forelegs are absent as in the males of the two other species of the southern hemisphere (Sinclair 1995a) and the Holarctic species *H. obliterata* Zetterstedt, 1838 (Collin 1961). This is probably a generic character, as Sinclair noted (1995a), and thus another autapomorphy of *Hormopeza* (in addition to the particular structure of the antenna), although its presence must be ascertained in all the known remaining species.
The dichoptic eyes in male being only present in the three southern hemisphere species, it is possible that *Hormopeza dureti*, *H. hadrocerca* Sinclair (from Tasmania) and *H. natalensis* Sinclair (from South Africa) form a monophyletic group within the genus. Nevertheless, eyes of *H. dureti* are more widely separated on face than on frons. On the other hand, this character must be used with caution on account of its homoplasic tendency in the Empidoidea (Sinclair 1995a).
By the shape of postgonites and the presence of a single process arising from between them (Fig. 1C), *H. dureti* seems closer to *H. hadrocerca* Sinclair than *H. natalensis* Sinclair (see Sinclair 1995a, figs 1, 4). This hypothesis is in agreement with known biogeographical data. Indeed the separation between Africa and South America is anterior to that between South America and Australia which have remained in contact *via* Antarctica until at least the Maastrichtian (– 70 Ma); the separation between Australia and Antarctica occurring between this period and the Eocene (– 50 Ma) (Matile 1990).
Little is known of the life history of the genus *Hormopeza* as the species are rather rare in nature, but frequently encountered swarming in smoke (they are also called empidid smoke flies) (Collin 1918; Kessel 1952, 1958, 1965). Species of *Hormopeza* are predators, found to prey upon the swarms of the platypezid smoke flies of the genus *Microsania* Zetterstedt, 1837 (Collart 1953; Kessel 1965).
On the other hand, it is not sure that mating obligatory takes place in swarms, contrary to what Sinclair indicated (1995a), because only one mating pair has been observed by Kessel (1965) close to a swarm; further observations are therefore urgently required. In fact, in the Empidoidea, it seems that only species of the subfamily Empidinae form obligatory mating swarms, except species of some subgenera belonging to the genus *Empis* Linnaeus, 1758 or *Rhamphomyia* Meigen, 1822, for instance *Lundstroemiella* Frey, 1922 (*Rhamphomyia* Meigen), *Xanthempis* Bezzi, 1909 and probably *Lissempis* Bezzi, 1909 (*Empis* Linnaeus) (Chvála 1994; Daugeron 1997b and in prep.).

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APPENDIX

Catalog of species of the genus *Hormopeza* Zetterstedt, 1838

H. brevicornis Loew, 1864: 83. Nearctic (Canada: Northwest Territories; United States: Alaska to California and South Dakota, New Hampshire).
H. bullata Melander, 1902: 274. Nearctic (Canada: Ontario; United States: Wyoming).
H. copulifera Melander, 1928: 96. Nearctic (United States: Alaska to Washington and Idaho); Palearctic (Finland, East Siberia, North European Territory).
H. dureti Daugeron, n.sp. Neotropical (Brazil: Minas Gerais).
H. fumicola Steyskal, 1969: 297. Nearctic (United States: Georgia).
H. hadrocerca Sinclair, 1995: 206. Australasian (Australia: Tasmania).
H. natalensis Sinclair, 1995: 204. Afrotropical (South Africa: Natal).
H. nigricans Loew, 1864: 83. Nearctic (Canada: Alberta, Yukon Territory; United States: Alaska, Idaho).
H. nitida Frey, 1953: 70. Oriental (Burma: Kambaiti).
H. obliterata Zetterstedt, 1838: 540. Palearctic (Belgium, Finland, Great Britain, North European Territory, Sweden, West Siberia); Nearctic.
H. senator Melander, 1928: 95. Nearctic (United States: District of Columbia).
H. virgator Melander, 1928: 96. Nearctic (United States: Idaho, Washington).

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